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DEPARTMENT OF THE ARMY
Washington, DC, 30 September 1981

**US ARMY AIR DEFENSE ARTILLERY EMPLOYMENT,
CHAPARRAL/VULCAN**

FM 44-3, 30 September 1977, is changed as follows:

1. Remove old pages and insert new pages as indicated:

Old Pages

iii, iv

Index 1 through Index 15

New Pages

iii, iv

Appendix L-1 through L-12

Index 1 through Index 15

2. New or changed material is indicated by a ★ or ■.
3. File this change sheet in front of the publication for reference purposes.

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US Army Air Defense Artillery Employment,
CHAPARRAL/VULCAN

Table of Contents

			PAGE
PART	I	DYNAMICS OF MODERN BATTLE	
Chapter	1	Facts About the Modern Battlefield	1-1
	2	The Enemy in Modern Battle	2-1
	3	The Third Dimension—The Air Threat	3-1
PART	II	HOW CHAPARRAL/VULCAN WILL COUNTER THE THREAT	
Chapter	4	Weapons and Organization	4-1
	5	Command and Control	5-1
	6	Employment Principles and Guidelines	6-1
	7	Support of Offensive Operations	7-1
	8	Support of Defensive Operations	8-1
	9	Combat Service Support	9-1
Appendix	A	Reconnaissance, Selection, and Occupation of Position (RSOP)	A-1
	B	Night Operations	B-1
	C	Vulcan in the Ground Support Role	C-1
	D	Special Tactical Operations	D-1
	E	Airborne and Air Assault Operations	E-1
	F	Special Environments	F-1
	G	Operations in Active Nuclear, Biological, or Chemical (NBC) Environment	G-1
	H	Operations Security (OPSEC)	H-1
	I	Tactical Operations Center	I-1
	J	Communications	J-1
	K	References	K-1
	L	Manual Short-Range Air Defense (SHORAD) Control System (MSCS)	L-1
	Index	Index 1

“A commander of an antiaircraft subunit of the air defense troop units under the ground forces should have a good knowledge of the organization of the motorized rifle (tank) unit and subunits, their battle formations and missions, and the methods of carrying them out in offensive and defensive engagements. He should achieve constant coordination with the troops being covered.”

**V.A. Gatsolayev, Air Defense Subunits in
Combat, May 1974**

***(Considered best unclassified Soviet
source on air defense regulations and
tactics.)***

★ APPENDIX L

MANUAL SHORT-RANGE AIR DEFENSE (SHORAD) CONTROL SYSTEM (MSCS)

Air defense artillery (ADA) fire units are more effective if they are provided accurate, timely, and reliable early warning. Early warning serves two purposes—alerting and cueing. Alerting information tells the user that an aircraft is approaching his position or the asset he is defending. Cueing information tells the user from which direction the aircraft will be coming, its range, and its tentative identification. This enables the user to focus his attention in that direction to detect the aircraft at a greater range. To obtain this information, SHORAD units currently use a manual control system.

The following provides standardized procedures for an MSCS. The objectives of the MSCS are to:

- Provide near real-time transmission of early warning information to SHORAD and other divisional units.
- Provide weapons control information to the SHORAD units organic to the division.
- Integrate ADA data into the division airspace management effort.

CONTENTS	
	PAGE
<i>Section I. Air Defense Coordination Net</i>	
Air Defense Coordination Section	L-2
Air Defense Coordination Net Procedures	L-3
SHORAD Grid System	L-4
How the SHORAD TOC Uses ADCN Data	L-7
Air Defense Coordination Net Summary	L-7
<i>Section II. Early Warning Broadcast Net</i>	
FAAR Early Warning Net	L-9
Communications Nets Summary	L-10
Airspace Management	L-12

Currently, SHORAD (short-range air defense) units, to include MANPAD (man-portable air defense) units, have a more limited early warning capability than HIMAD (high-to-medium-altitude air defense) units. HIMAD units use sophisticated automatic data links and radar data from various sources to provide near real-time alerting and cueing information. The only organic source of early warning for the divisional SHORAD battalion, however, is its forward area alerting radar (FAAR) platoon.

Information from FAAR is transmitted via FM voice and radio frequency data link (RFDL) to fire units operating within the FAAR's area. These fire units (including Chaparral and Vulcan squads and Redeye/Stinger teams) receive this information on their target alert data display sets (TADDS). Additionally, divisional ADA battalions manually transmit early warning received from HIMAD sources to both their own fire units and to divisional maneuver elements.

This appendix provides standardized procedures for the MSCS, to include alternate modes of communications when required. In addition to the established FAAR net, the MSCS is implemented through two other nets. The first of these is an air defense coordination net (ADCN) that provides early warning information to the SHORAD battalion from HIMAD or Air Force sources. The second additional net is an early warning broadcast net (EWBN) that provides a standardized means of manual early warning within the division. Both nets use communications equipment presently available within the various units.

MSCS data is available to any unit which is capable of receiving it. This includes ADA units, the divisional maneuver units, and combat support/service support units. MSCS data, therefore, provides all these units advance warning of aircraft attack. This allows the implementation of both passive and active air defense measures and increases the effectiveness of "all arms air defense."

Section I. AIR DEFENSE COORDINATION NET

The air defense coordination net (ADCN) is used to transmit HIMAD-generated track information to the SHORAD tactical operations center (TOC). This information can originate at a HIMAD fire direction center (Hawk, Nike Hercules, or Patriot fire control

van) or Air Force forward air control post (FACP), control and reporting center (CRC), or control and reporting post (CRP). The net control station (NCS) for the ADCN is the SHORAD battalion air defense coordination section (ADCS).

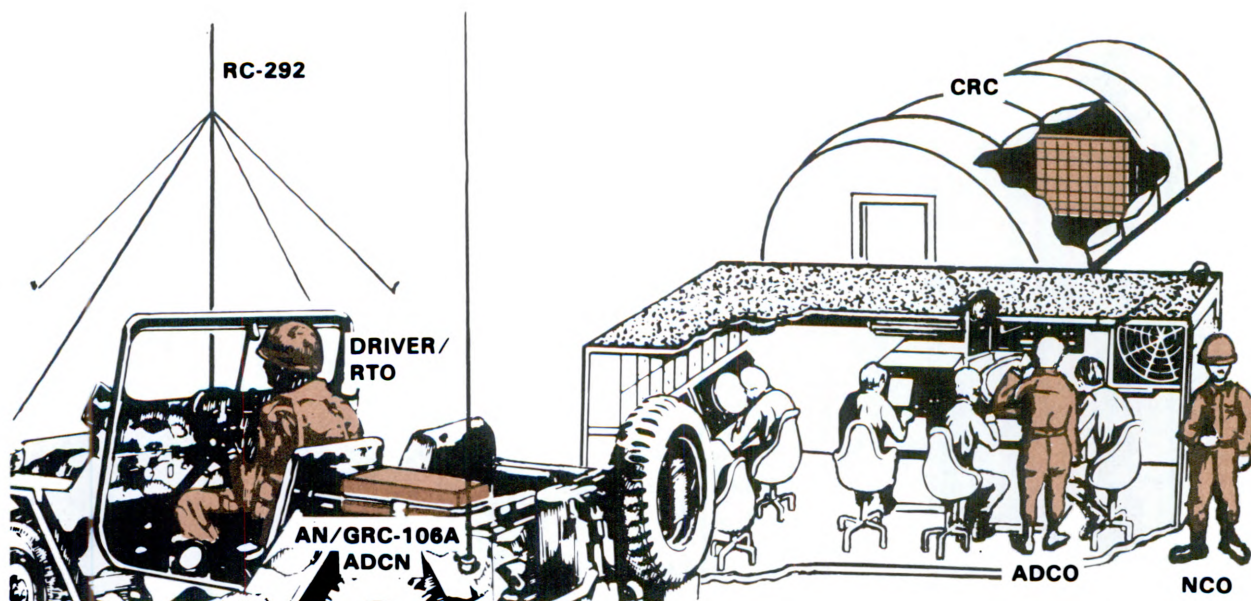
AIR DEFENSE COORDINATION SECTION

The air defense coordination section (ADCS) consists of three personnel: the *air defense coordination officer (ADCO)*, an *NCO*, and a *driver/radio-telephone operator (RTO)*. During operations the section or, if not available, one of the brigade's liaison sections deploys to the nearest source of HIMAD track information. Once deployed the ADCS acts as NCS for the air defense

coordination net, using its AN/GRC-106A AM radio to establish two-way communications with the SHORAD TOC. The ADCS also passes air defense (AD) command and control information (e.g., air defense warnings, weapons control status, etc.) disseminated through HIMAD/USAF control systems to the SHORAD TOC over this net.

L-2

AIR DEFENSE COORDINATION NET PROCEDURES

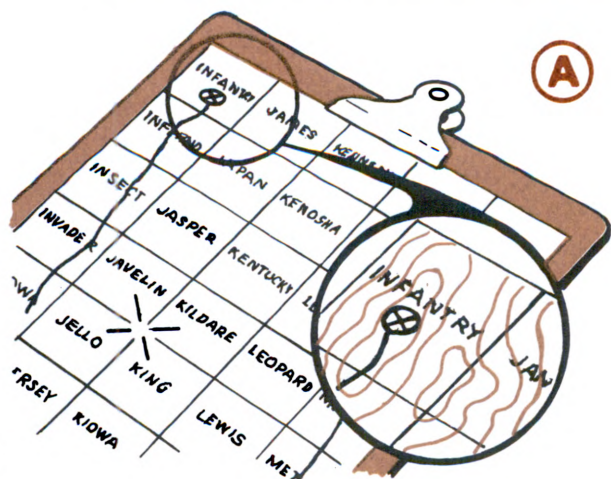


The ADCO obtains HIMAD track information by physically viewing a:

Radar Console. This method provides the most timely early warning information. The console can either be a fire unit or control facility radar scope on which the division's area of operations is scribed. (The Hawk platoon command post radar scope does not provide adequate data and should not be used for this purpose.)

Manual Plotting Board. In situations where it is impossible for the ADCO to physically view a radar scope, adequate data can be obtained from a manual plotting board. As with the radar console method, the division's area of operations should be marked on the plotting board.

Here is how HIMAD-generated track data is passed to the SHORAD unit —



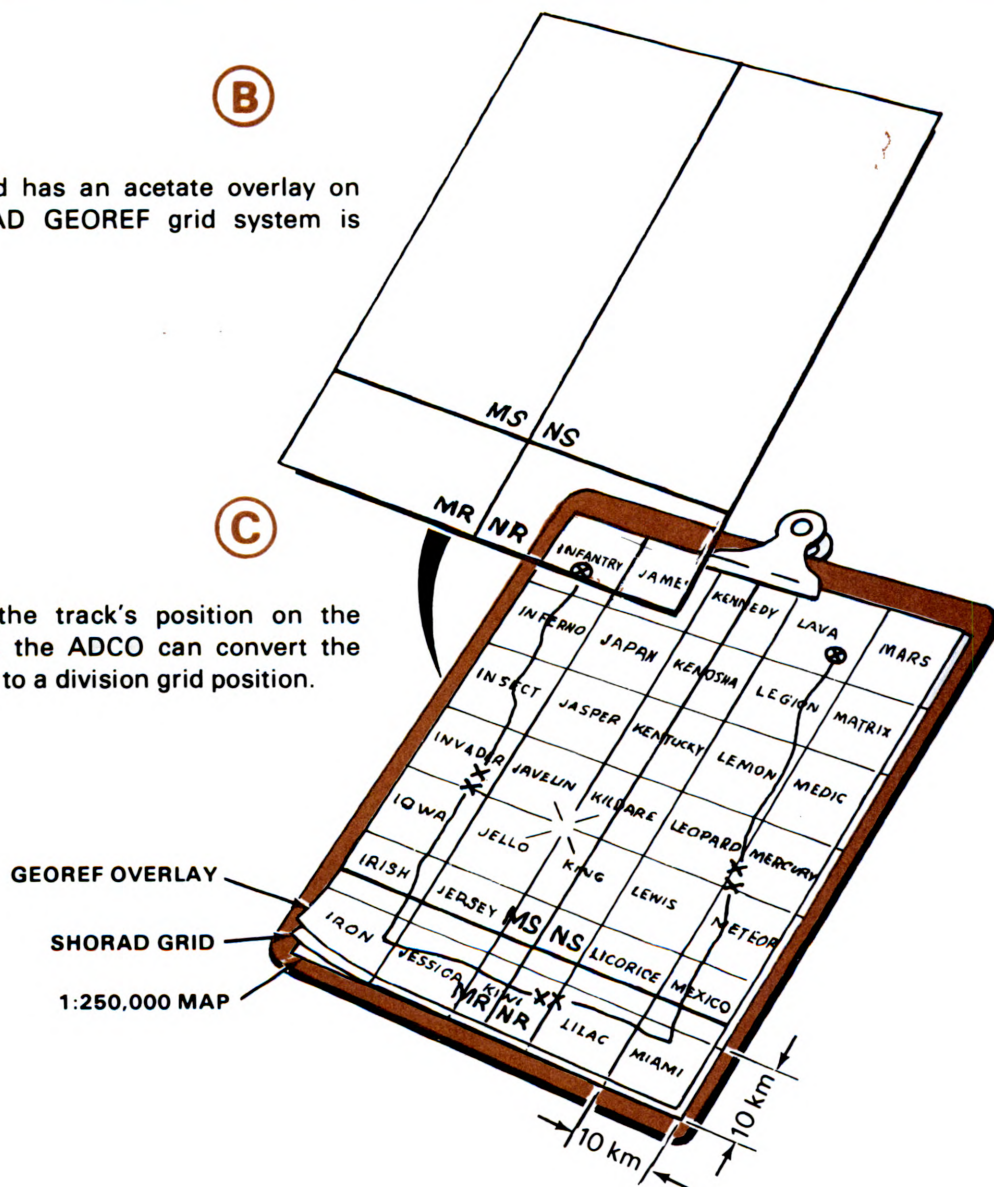
The ADCO, viewing a radar console or manual plotting board, detects a hostile or unknown track either within, or approaching the division's area of operations. He notes the track's GEOREF (World Geographic Reference System) position, and converts it to a division grid position. For this purpose, the ADCO has a clipboard-mounted map of the division's area of operations, marked with a unique SHORAD grid of the division area of operation.

(B)

The clipboard has an acetate overlay on which the HIMAD GEOREF grid system is marked.

(C)

By plotting the track's position on the GEOREF overlay, the ADCO can convert the GEOREF position to a division grid position.



SHORAD GRID SYSTEM

The ADCO specifies the track's position through the use of a unique SHORAD grid system. A standard military map is used with a specified coordinate as a common reference point. This reference point will normally be designated in the air defense annex of the division operations order or in the division CEOI, as will be the map sheet series number. The reference point, located in the middle of the division area, is used to center the SHORAD grid matrix.

The SHORAD grid matrix is a standardized matrix consisting of 400 grid squares with a code name assigned to each square. Users need only use that portion of the matrix applicable to their areas of operation. The matrix used should be large enough to extend at least 20 kilometers beyond the division boundaries. The entire matrix or corresponding map sheets are normally required only at the division, SHORAD battalion TOC, or ADCS level.

Update information on tracks is not reported. If the track moves into another 10

km grid designator, it would be rebroadcast in total.

TRACK REPORT EXAMPLES

In the SHORAD grid example, location is "LEGION," and raid size is a single aircraft. Therefore, the ADCO's track report would be —

"LEGION. . .ONE"

If, after a certain amount of time, the track's position had changed to another grid square, the ADCO would transmit another track report like this —

"KENTUCKY. . .ONE"

If time permits, the ADCO may send an extended track report such as —

"KENTUCKY. . .ONE. . .UNKNOWN. . .SOUTHWEST. . .JET"

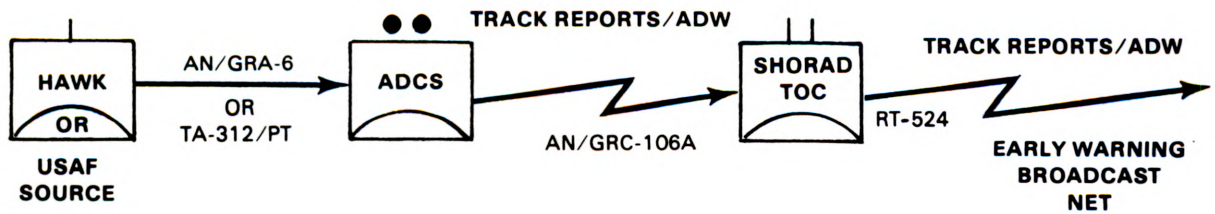
HOW THE SHORAD TOC USES ADCN DATA

SHORAD TOC personnel receive the ADCO's track report on their AN/GRC-106A radio. It is recorded, filtered, and voice-told over the early warning broadcast net (EWBN).

AIR DEFENSE COORDINATION NET SUMMARY

The ADCS is the NCS for the air defense coordination net (ADCN). It uses the ADCN to transmit track reports to the SHORAD TOC. Located where he can view a radar console or manual plotting board, the ADCO —

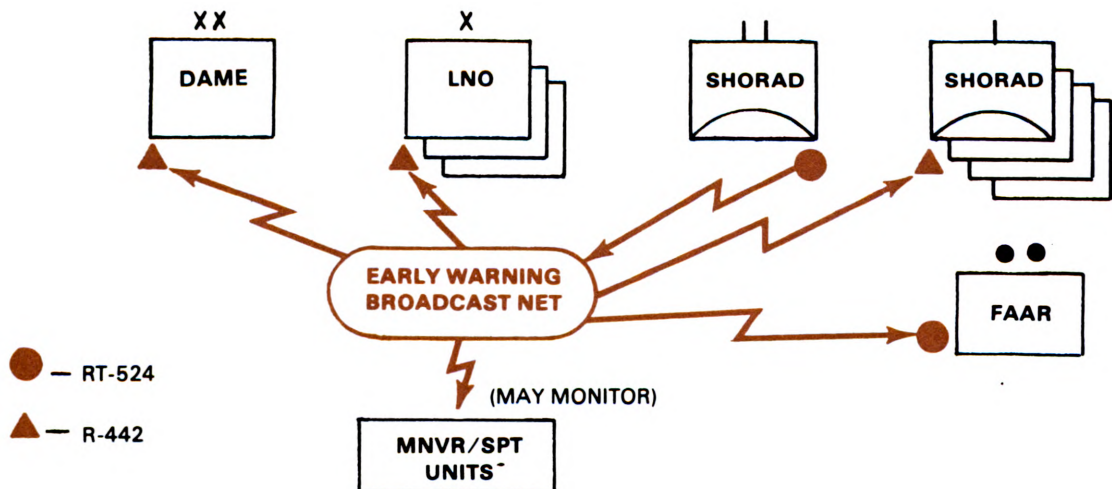
- Detects tracks located within or approaching the division's area of operations.
- Converts track GEOREF position to a SHORAD grid position.
- Transmits track early warning to the SHORAD TOC in a standardized format either directly or through the ADCS driver/RTO.
- Acquires and transmits AD command and control information to the SHORAD TOC.



SHORAD TOC personnel receive the ADCO's track report on their AN/GRC-106A radio. They —

- Record the track.
- Determine if the track requires retransmission.
- Transmit early warning over the EWBN.
- Transmit air defense warnings (ADW) over the EWBN and transmit other AD command and control information over the battalion command net.

Section II. EARLY WARNING BROADCAST NET



Standardized SHORAD MSCS procedures require that the SHORAD battalion establish an early warning broadcast net (EWBN).

The EWBN is a one-way FM net originating at the division or the SHORAD battalion. Any unit with an FM receiver and

within line of sight and operating range restrictions can obtain early warning information simply by monitoring this net. Units unable to receive this information due to the restrictions mentioned above can obtain early warning from adjacent, subordinate, or parent units that are receiving the information.

Track early warning transmitted over the air defense coordination net from HIMAD sources is recorded and filtered at the SHORAD TOC and then retransmitted over the EWB. N.

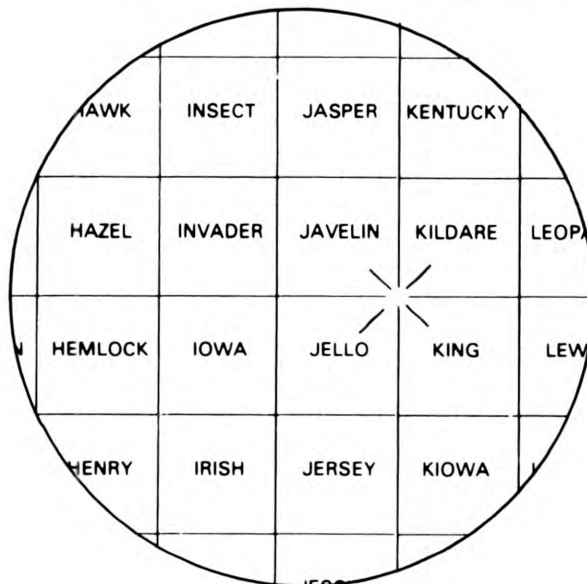
Alternate routes for command and control information are provided for in the MSCS (see figure page L-10); these include the EWB. N. and command nets. In the event of loss of communication in the MSCS, procedures will be established to make maximum effective use of remaining command and control facilities. For example, weapons control statuses, hostile criteria and emergency information received from the ADCO, division TOC and/or the brigade TOC, can be passed to SHORAD units via the EWB. N. or via the SHORAD battalion command net. (Emergency information is

information that must be disseminated rapidly throughout the division, such as NBC strike warnings and enemy airmobile assaults. The division G3 and G2 are normally the primary sources of this information, which is usually disseminated through the division intelligence net and relayed down command nets.) Primarily the EWB. N. provides the means to rapidly disseminate this information throughout the SHORAD battalion. Alternately the command nets will be used to disseminate emergency messages and critical warning information.

The communications equipment to support the net listed above is presently available within all SHORAD battalions. (EWB. N. range may be extended by the use of AN/VRC-49 radios.)

FAAR EARLY WARNING NET

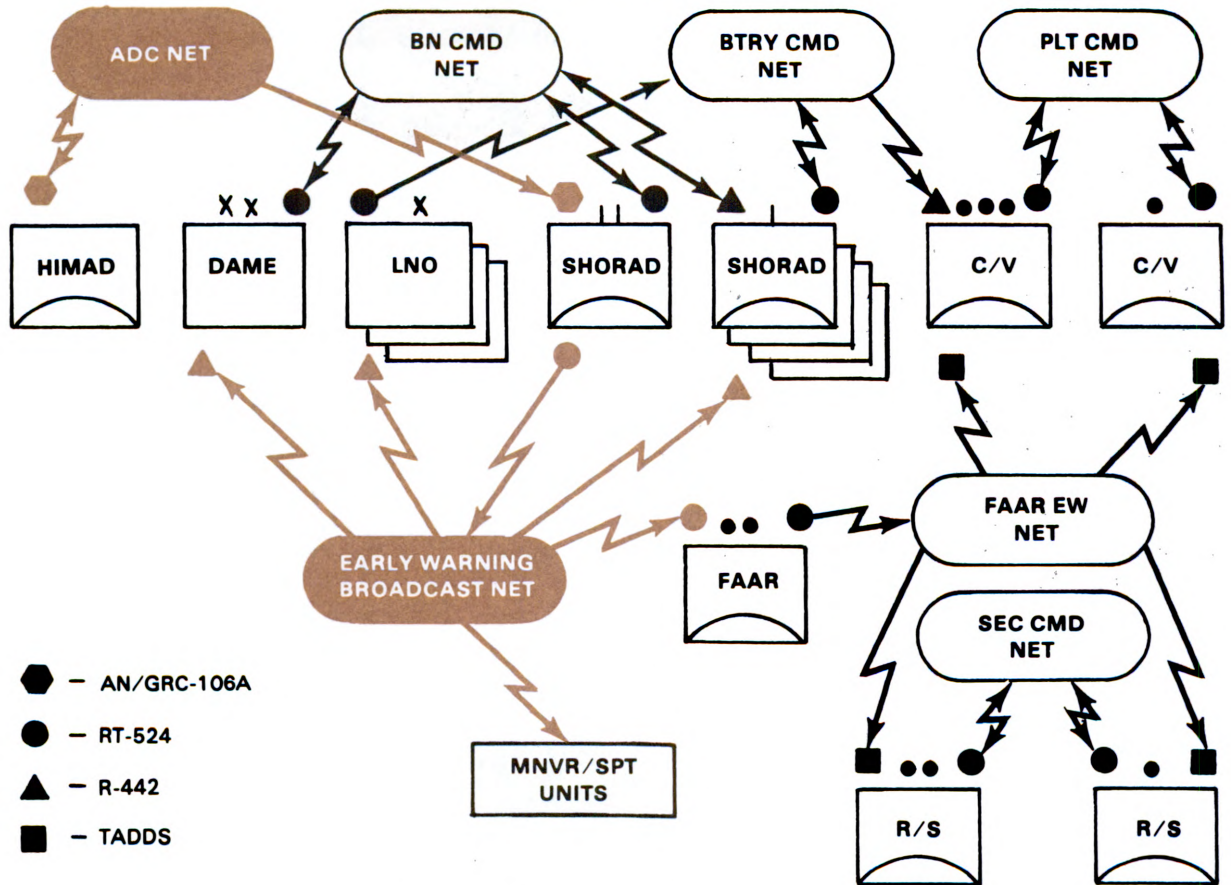
A platoon of eight FAAR sections is organic to the SHORAD battalion. FAAR sections are deployed in support of the Chaparral/Vulcan and Redeye/Stinger fire units supporting the division. To monitor the



EWB. N., FAAR sections must use the AN/VRC-46 radio normally used for their platoon command net. The FAAR operator voice-tells the early warning information received from the SHORAD TOC. In addition, tracks detected by his own systems are sent by either voice or radio frequency data link (RFDL) over the AN/VRC-46 radio. When operating in a voice-tell mode only, the FAAR operator places an overlay of his portion of the SHORAD grid system on the FAAR scope. This overlay can be further divided into 1-km increments to provide greater position accuracy.

Information transmitted by the FAAR is received at the Chaparral/Vulcan and Redeye/Stinger command posts, sections, and fire units on the target alert data display set (TADDS) receiver or an R-442 auxiliary receiver. It can also be received by supported maneuver units, as well as by combat support/service support units, when transmitted by voice-tell.

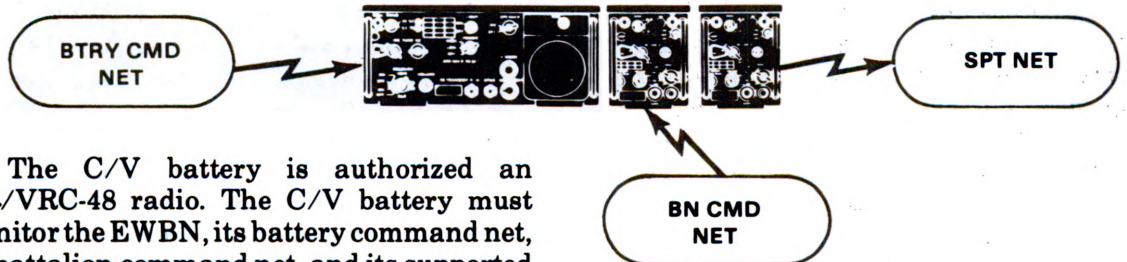
COMMUNICATIONS NETS SUMMARY



The Manual SHORAD Control System is supported with the communications nets illustrated. These nets currently can be implemented with the available equipment in the C/V battalion. However, simultaneous monitoring of all nets is not possible. The most effective communication system requires —

C/V BATTERY CP

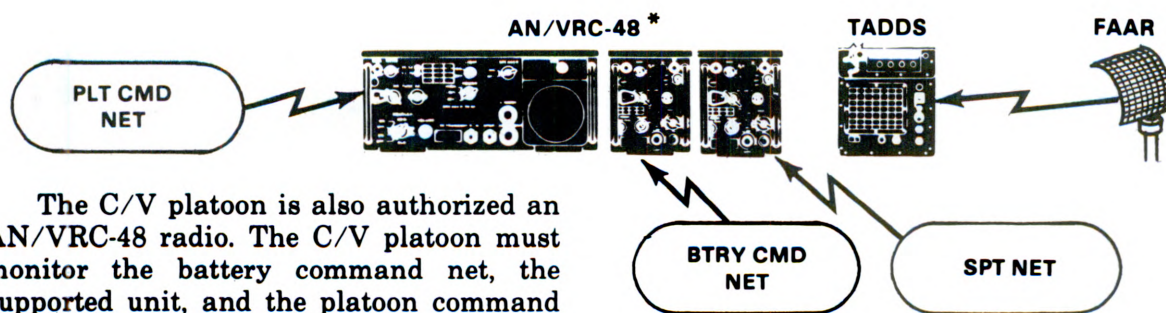
AN/GRC-48



The C/V battery is authorized an AN/VRC-48 radio. The C/V battery must monitor the EWB, its battery command net, and its supported unit. However, the communications equipment authorized will not support all of these needs. The C/V battery must, therefore, change from one of these nets if it is

necessary to monitor another net. If the battery is collocated with its supported unit TOC, communications to that element can be established by land line.

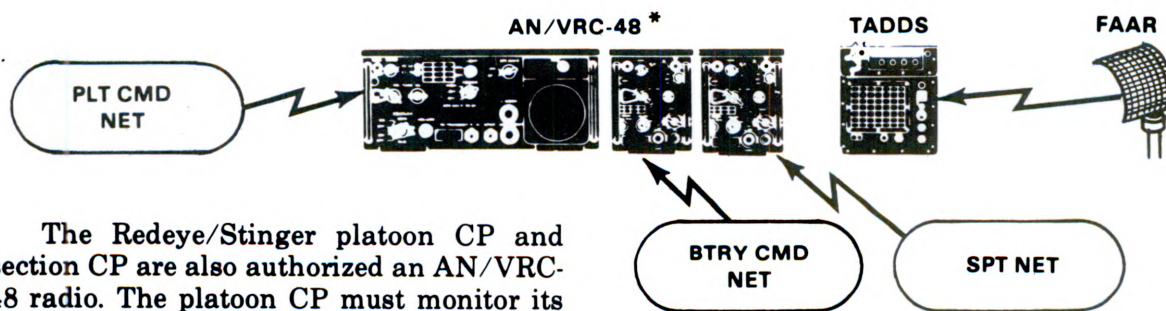
C/V PLATOON CPs



The C/V platoon is also authorized an AN/VRC-48 radio. The C/V platoon must monitor the battery command net, the supported unit, and the platoon command net; however, the platoon has the same equipment limitations as the battery. The C/V platoon must also change from one of these nets if it is necessary to monitor another net. Long-range early warning information from the SHORAD TOC and locally-generated FAAR early warning is received over the TADDS FM receiver from the

nearest FAAR section. If FAAR-transmitted early warning is not received, the battery CP will send pertinent early warning data to the platoon over the battery command net. If land lines are used for any of the above nets, a radio would be freed to monitor the EWBN.

REDEYE/STINGER PLATOON/SECTION CP

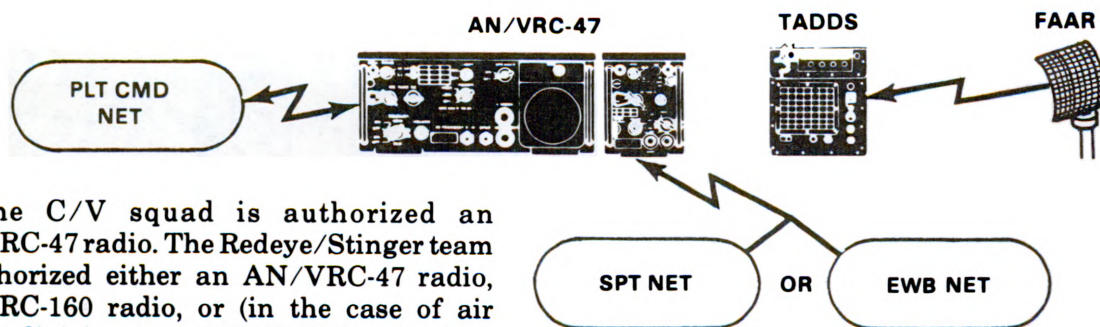


The Redeye/Stinger platoon CP and section CP are also authorized an AN/VRC-48 radio. The platoon CP must monitor its parent C/V battery's command net, its platoon command net, and its supported unit net. The Redeye/Stinger section CP must monitor its platoon command net, its section command net, and its supported unit net. Long-range early warning information from the SHORAD TOC and locally-generated FAAR early warning is received over the TADDS FM receiver from the nearest FAAR section. If early warning is not received, the battery CP will send pertinent early warning

data to the platoon over the battery command net. To monitor the EWBN, the Redeye/Stinger platoon or section CP must change from one of these other frequencies. If the Redeye/Stinger platoon/section CP is collocated with its parent C/V battery's CP, a C/V platoon CP, or a supported unit CP, communications to these elements can be established by land line. This will free one radio to monitor the EWBN.

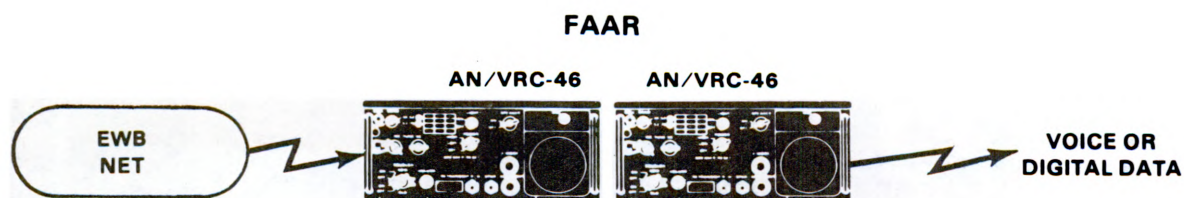
***NOTE:** These radios are authorized by the DA approved TOE; however, current MTOEs authorize only AN/VRC-47 radios.

C/V SQUADS AND REDEYE/STINGER TEAMS



The C/V squad is authorized an AN/VRC-47 radio. The Redeye/Stinger team is authorized either an AN/VRC-47 radio, AN/GRC-160 radio, or (in the case of air assault divisions) an AN/PRC-77 radio. The C/V squad and the Redeye/Stinger team must monitor the squad's or team's respective platoon or section command net, and either

the supported unit command net or the EWB. The squads/teams monitor the FAAR on the TADDS.



The FAAR's AN/VRC-46 receiver-transmitter is used to transmit either voice or RFDL early warning and command and control information. The FAAR's other radio,

also an AN/VRC-46, is used to monitor the EWB. The squads/teams monitor the FAAR on the TADDS.

AIRSPACE MANAGEMENT

As one of the participants in the airspace management effort, the SHORAD battalion is responsible for providing command and control information, early warning information, and SHORAD unit locations to the air defense artillery division officer (ADADO) at the division airspace management element (DAME). In return, the ADADO must provide airspace management information to the SHORAD TOC. This information can be exchanged via courier, radio teletype, or the battalion command net.

The DAME falls under the direct supervision of the division G3 (AIR) and

includes elements from the division aviation battalion, division SHORAD battalion, office of the Air Force liaison officer, office of the fire support officer, and the air traffic control platoon. Normally, elements of the DAME will be at both the division main command post and the division forward command post. The assistant division air defense officer is the ADA representative to the DAME. He relays command and control information received from the corps airspace management element to the SHORAD TOC via the SHORAD battalion command net.

INDEX

FM 44-3

	Page
Actions Prior to Attack, Air Support (Threat)	3-8
Active Defense	8-1
Covering Force Area	8-3
Main Battle Area	8-3
Rear Area	8-3
ADA Support of Offense	7-3
ADA Survivability (OPSEC)	H-2
Aerial Reconnaissance (Threat)	3-6
Agent Characteristics, Chemical-Biological	G-7
Air Army (Threat)	3-7
Air Assault Operations	E-2
Airborne/Air Assault Division Vulcan Battalions	4-10
Airborne and Air Assault Operations	E-1
Air Assault	E-2
Airborne	E-1
Airborne Sensors	H-4
Aircraft, Army	1-7
Aircraft Attack Techniques (Threat)	3-10
Attack Helicopter	3-14
Fighter-Bomber	3-10
Aircraft Gunships	H-4
Air Defense Artillery (Modern Weapons)	1-3
Air Defense Coordination Net	L-2
Air Defense Coordination Section	L-2
Air Defense (Threat)	2-6
Air Defense Support of Offense	7-3
Air Defense Warnings and States of Alert	5-11
Air Defense Weapons (Threat)	2-6

	Page
Air Division (Threat)	3-7
Air Force Organization (Threat)	3-6
Air Regiment (Threat)	3-8
Air Space Management	L-12
Air Support	1-6
Air Support of Maneuver Forces (Threat)	3-8
Air Support During the Attack	3-9
Air Support of Defensive Operations (Threat)	3-10
Air Support of Offensive Operations	3-8
Air Support of Retrograde Operations	3-8
Air Support of the Field Artillery Preparation	3-8
Air Support Prior to the Attack	3-8
Concept of Air Support	3-8
Support of the Exploitation	3-10
Air Threat	3-1
Air Threat Assessment (Threat)	6-7
Armed Helicopters (Threat)	3-5
Army Aircraft	1-7
Artillery Air Defense (Modern Weapons)	1-3
Artillery, Field (Modern Weapons)	1-3
Artillery (Threat)	2-4
Artillery Weapons (Threat)	2-5
Attack, Air Support (Threat)	3-9
Attack, Helicopter (Threat)	3-14
Attack, Profiles Fighter-Bombers	3-11
Background, The Threat Picture	3-1
Balance, Defense	6-13
Basic Principles, Employment	6-1
Integration	6-5
Mass	6-1
Mix	6-3
Mobility	6-4

Index 2

	Page
Battalion, Communications	J-2
Battalion Organization	4-9
Battery Organization	4-8
Biological and Chemical Operations	
Agent Characteristics	G-7
Conditions	G-7
Detection	G-7
Protective Measures	G-7
Bounding Overwatch (Vulcan)	7-11
Built-Up Areas, Special Tactical Operations	D-1
Camouflage (OPSEC)	H-6
Capabilities, Weapons	4-2
Chaparral	6-18
Battery Defense	6-18
Organization	4-7
Platoon	6-17
System Capabilities/Limitations	4-2
With Redeye	6-17
Chaparral and Vulcans, Mixed Defense	6-18
Chaparral/Vulcan	
Battalion Air Defense Coordination Officer	5-5
Battalion, Nondivisional	6-11
Battalion, Supporting Defense	8-4
Battery Communications	J-6
Combat Service Support for Units	9-3
Units, Organization	
Battalion	4-9
Airborne/Air Assault Division (Vulcan)	4-10
Divisional	4-9
Nondivisional	4-10
Battery	4-8
Platoon	4-8
Squad	4-7
Chemical and Biological Operations	
Agent Characteristics	G-7

	Page
Conditions of Use	G-7
Detection	G-7
Protective Measures	G-7
Class I Supplies	9-4
Class II, IV, VI, VII, and X Supplies	9-4
Class II, IV, VI, VII, and X Support	9-5
Class III Supplies	9-5
Class III Support	9-6
Class V Supplies	9-6
Class V Support	9-7
Combat Force Structure (Threat)	2-2
Combat Organization for Scenario	7-5
Combat, Radioelectronic (Threat)	2-11
Combat Service Support	9-1
Class I through X Supplies and Support	9-4 — 9-8
Division Support Command (DISCOM)	9-1
For Chaparral/Vulcan Units	9-3
Maintenance, Recovery, and Repair Parts	9-7
Medical	9-8
Command and Control	5-1
Air Defense Warnings and States of Alert	5-11
Divisional Battalions	5-4
Engagement Decision	5-12
Fire Distribution	5-11
Nondivisional Battalions	5-6
Rules of Engagement	5-7
Theater and Corps Air Defense	5-2
Communications	
Battalion	J-2
Chaparral/Vulcan Battery	J-6
Headquarters and Headquarters Battery	J-5
Responsibility	J-1
Supplemental Early Warning	J-10
Communications Security (OPSEC)	H-7

Index 4

	Page
Concept and Types of Offensive Operations	7-2
Concept of Air Support (Threat)	3-8
Conditions of Use, Chemical-Biological	G-7
Convoys or March Columns (Defense)	6-20
Coordination Net	L-2
Coordination Section	L-2
Corps ADA, Employment	6-10
Countering The Threat, C/V (Part II)	II-1
Countermeasures, Electronic	H-5
Covering Force Area (Defense)	8-3
Criticality	6-6
Deception (OPSEC)	H-1, H-5
Decision, Engagement	5-12
Defense	
Active	8-1
Chaparral/Vulcan Battalion, Support	8-4
Convoys or March Columns	6-20
Covering Force Area	8-3
Hawk Battalion	8-5
In Depth	6-15
Larger Asset	6-19
Main Battle Area	8-3
Mixed Defense (C/V)	6-18
Operations, Scenario	8-6
Rear Area	8-3
Redeye	8-5
Defense of Stationary Assets	6-12
Balance	6-13
Chaparral and Vulcan Mixed Defense	6-18
Chaparral Battery Defense	6-18
Chaparral Platoon	6-17
Chaparral with Redeye	6-17
Defense in Depth	6-15
Defense of a Larger Asset	6-19
Early Engagement	6-14

	Page
Mutual Support	6-14
Vulcan Battery Defense	6-15
Vulcan Platoon	6-16
Vulcan with Redeye	6-16
Weighted Defense	6-20
Defense of Units on the Move	6-20
Convoys or March Columns	6-20
Maneuver Forces	6-23
Defense Operations	8-6
Delivery Technique	3-11
Laydown	3-11
Popup	3-12
Desert Operations	F-2
Detection, Chemical-Biological Agents	G-7
Development of New Aircraft (Threat)	3-4
Development (Threat)	3-2
Direct Support	6-9
Direct Support Hawk Battalion	6-10, 8-5
Division Support Command (DISCOM)	9-1
Divisional Battalions--Command and Control	5-4
Divisional EWBN	L-8
Doctrine, Threat, Air Defense	2-9
Dynamics of Modern Battle	I-1
Early Engagement	6-14
Early Warning Broadcast Net (EWBN)	L-8
Early Warning Procedures (TOC)	I-5
Early Warning, Supplemental (Communications)	J-10
ECCM Techniques (OPSEC)	H-8
Electronic Countermeasures	H-5
Electronic Warfare	H-2
Modern Battlefield	1-8

Index 6

	Page
Radioelectronic Combat Threat	2-11
Employment, FAAR	6-11
Employment, Points for Emphasis	6-24
Enemy	
Air Defense	2-6
Doctrine	2-9
Weapons	2-6
Air (Threat Assessment)	6-7
Artillery	2-4
Artillery Weapons	2-5
Combat Force Structure	2-2
In Modern Battle	2-1
Intelligence Collection Threat	H-1
Motorized Rifle Units	2-2
Radioelectronic Combat	2-11
Tank Units	2-3
Engagement Decision, Squad Leader's	5-9, 5-12
Environments, Special	F-1
Desert	F-2
Jungle	F-5
Mountain	F-6
Northern	F-4
Exploitation, Support of (Threat)	3-10
External Radio Nets	J-5, J-6
FAAR Early Warning Net	L-9
Facts About the Modern Battlefield	1-1
Field Artillery	1-3
Field Artillery Preparation, Air Support (Threat)	3-8
Fighter-Bomber, Attack Techniques, Threat	3-10
Fighting at Night	1-6
Fire and Maneuver (Vulcan)	7-12
Fire Distribution	5-11
Forward Area Alerting Radar	
Capabilities and Limitations	4-6

	Page
Employment	6-11
Functions, TOC	I-1
General Support	6-9
Grid System	L-4
Ground Attack Aircraft (Threat)	3-4
Ground Support Role, Vulcan	C-1
Hawk Battalion (Direct Support)	6-10, 8-5
Headquarters and Headquarters Battery Communications	J-5
Heliborne Infantry	1-3
Helicopters, Armed, Threat	3-5
Helicopters, Attack Threat	3-14
Helicopter Gunships	H-4
Hostile Criteria	5-8
How ADA Supports the Defense	8-4
Chaparral/Vulcan Battalion	8-4
Hawk Battalion	8-5
Redeye	8-5
Human Intelligence	H-2
Infantry, Heliborne (Modern Weapons)	1-3
Infantry, Mechanized (Modern Weapons)	1-2
Information Security	H-1
Integration, Employment	6-5
Integration into Force OPSEC Plan	H-3
Intelligence Collection Threat, Enemy	H-1
Internal Radio Nets	J-5, J-6
Introduction of New Munitions (Threat)	3-5
Issue Orders, RSOP	A-3
Jungle Operations	F-5
Laydown Delivery Technique	3-13

Index 8

	Page
Light and Noise Discipline	H-7
Low-Level Attack, Fighter-Bomber	3-10
Main Battle Area, Defense	8-3
Maintenance, Recovery, and Repair Parts	9-7
Maneuver Forces, Air Support (Threat)	3-8
Maneuver Forces, Defense of	6-23
Manual SHORAD Control System (MSCS)	L-1
Mass	6-1
Measures, (OPSEC)	H-5
Camouflage	H-6
Communications Security	H-7
Deception	H-5
ECCM Techniques	H-8
Light and Noise Discipline	H-7
Movement	H-8
Physical Security	H-9
Mechanized Infantry, Modern Weapons	1-2
Medical Combat Service Support	9-8
Missiles, Tactical Air-to-Surface (TASM)	H-4
Mix	6-3
Mixed Defense, Chaparral and Vulcan	6-18
Mobility	1-5, 6-4
Modern Battle, Dynamics of (Part I)	I-1
Modern Battle, Enemy in	2-1
Modern Battlefield	
Air Support	1-6
Army Aircraft	1-7
Characterization	1-1
Electronic Warfare	1-8
Fighting at Night	1-6
Mobility	1-5
Modern Weapons	1-2
Operations in NBC Battle	1-7

	Page
Modern Battle, Threat	2-1
Modern Weapons	1-2
Motorized Rifle Units (Threat)	2-2
Mountain Operations	F-6
Movement (OPSEC)	H-7
Move Units to Position (RSOP)	A-4
Movement Techniques -- How Vulcan Supports	7-8
Multichannel Circuits	J-10
Mutual Support	6-14
New Aircraft Development (Threat)	3-4
New Munitions, Introduction (Threat)	3-5
Night Fighting	1-6
Night Operations	B-1
Nondivisional Battalions--Command and Control	5-6
Nondivisional C/V Battalion	4-10, 6-11
Northern Operations	F-4
Nuclear Battle	G-1
Nuclear, Biological, and Chemical Battle (Operations).	1-7
Nuclear Operations	G-1
Nuclear Protective Measures	G-4
Nuclear Weapons Effects	G-2
Occupy, Organize, and Improve Position (RSOP)	A-4
Offensive Operations, Air Support (Threat)	3-8
Offensive Operations, Support of	7-1
Offensive Operations, Types of	7-2
Operations in NBC Battle	1-7
Operations in Active NBC Environment	G-1
Operations, Night	B-1

Index 10

	Page
Operations Security (OPSEC)	H-1
Enemy Intelligence Collection Threat	H-1
Integration into Force OPSEC Plan	H-3
Measures	H-5
Radioelectronic Combat (Threat)	H-3
Relation to ADA Survivability	H-2
Standing Operating Procedures	H-9
Suppressive Attacks	H-4
Ordnance Delivery, Fighter Bomber	3-10
Ordnance, Low-Level Attacks	3-13
Organization and Equipment (TOC)	I-1
Organizations (Threat)	2-2
Motorized Rifle Units	2-2
Tank Units	2-3
Organizing for Combat	6-6
Criticality	6-6
Direct Support (DS)	6-9
Enemy Air	6-7
General Support (GS)	6-9
General Support-Reinforcing (GS-R)	6-9
Offense	7-5
Operational Control and Attachment	6-10
Recuperability	6-7
Reinforcing (R)	6-9
Scenario	7-5
Vulnerability	6-7
Photographic Intelligence	H-2
Physical Security (OPSEC)	H-1
Plan Defense, RSOP	A-2
Plan Occupation	A-4
Plan Reconnaissance, RSOP	A-2
Platoon Organization	4-8
Popup Delivery Technique	3-11
Prepare for Occupation	A-4
Protective Measures (Chemical-Biological Agents)	G-7

	Page
Protective Measures (Nuclear)	G-4
Radio Nets	J-5, J-6, L-10, L-11
Radioelectronic Combat Threat (OPSEC)	2-11, H-3
Rear Area (Defense)	8-3
Reconnaissance, Selection, and Occupation of Position (RSOP)	A-1
Recuperability	6-7
Redeye Guided Missile System	4-5
Capabilities	4-5
Limitations	4-5
Supporting Defense	8-5
References	K-1
Responsibility, Communications	J-1
Right of Self-Defense	5-9
River Crossing, Retrograde	D-6
River Crossing, Special Tactical Operations	D-3
RSOP Sequence	A-3
Rules of Engagement	5-7
Applying	5-9
Hostile Criteria	5-8
Right of Self-Defense	5-9
Varying Weapons Control Status	5-9
Weapons Control Status	5-8
Security, Communications (OPSEC)	H-7
Select Positions, RSOP	A-3
Self-Defense, Right of	5-9
Self-Propelled Vulcan	4-3
Sensors, Airborne	H-4
SHORAD Grid System	L-4
Signal Intelligence	H-2
Signal Security	H-1
Special Environments	F-1
Desert	F-2

Index 12

	Page
Jungle	F-5
Mountain	F-6
Northern	F-4
Special Tactical Operations	D-1
Built-Up Areas	D-1
River Crossing	D-3
SP Vulcan System	4-3
Capabilities	4-3
Limitations	4-4
Squad Leader's Engagement Decision	5-9
Squad Organization	4-7
Standing Operating Procedures (OPSEC)	H-9
States of Alert	5-11
Stationary Assets, Defense of	6-12
Supplies, Class I through X	9-4 — 9-7
Support	
Air	1-6
Chaparral/Vulcan Battalion	8-4
Defense, ADA	8-4
Defensive Operations	8-1
Defensive Operations (Threat)	3-10
Hawk Battalion	8-5
Offensive, ADA	7-3
Offensive Operations	7-1
Redeye	8-5
Retrograde Operations (Threat)	3-10
Suppressive Attacks (OPSEC)	H-4
Surface Weapons (OPSEC)	H-4
Survivability of ADA (OPSEC)	H-2
System Capabilities and Limitations	4-2
Tactical Air Force Organization (Threat)	3-6
Air Army	3-7
Air Division	3-7
Air Regiments	3-8
Tactical Air-to-Surface Missiles (TASM)	H-4

	Page
Tactical Operations Center	I-1
Functions	I-1
Organization and Equipment	I-1
Tactical Operations, Special	D-1
Built-Up Areas	D-1
River Crossing	D-3
Tank Units (Threat)	2-3
Tanks (Modern Weapons)	1-2
Target Alert Data Display Set, Capabilities/Limitations	4-5
Target Alerting and Early Warning Procedures	I-5
Target Alerting Procedures (TOC)	I-5
Track Reports	L-6
Theater and Corps Air Defense, Command and Control	5-2
Third Dimension, Air Threat	3-1
Threat	
Aerial Reconnaissance	3-6
Air Defense Doctrine	2-9
Air Defense Weapons	2-6
Artillery	2-4
Artillery Weapons	2-5
Combat Force Structure	2-2
Development	3-2
Modern Battle, the Enemy in	2-1
Motorized Rifle Units	2-2
Picture	3-1
Radioelectronic Combat	2-11
Tactical Air Force Organization	3-6
Threat (Air) Development	3-2
Threat and Corps Air Defense	5-2
TOC (Tactical Operations Center)	I-1
Towed Vulcan System	4-4
Capabilities	4-4
Limitations	4-4
Traveling Overwatch (Vulcan)	7-10
Traveling (Vulcan Support)	7-9
Types Ordnance, Low-Level Attack	3-13

Index 14

	Page
Vulcan	
Battalion, Airborne/Air Assault Division	4-10
Battery Defense, Stationary Asset	6-16
Fire and Maneuver	7-12
Movement Techniques	7-8
Battalion Task Force (Offense)	7-8
Bounding Overwatch	7-11
Fire and Maneuver	7-12
Traveling	7-9
Traveling Overwatch	7-10
Organization (Chaparral/Vulcan) Units	4-7
Platoon Defense, Stationary Asset (Chaparral/Vulcan)	6-15; 6-17
Self-Propelled	4-3
Capabilities	4-3
Limitations	4-4
Support, Ground Role	7-12
Support of Battalion Task Force- Scenario	C-1
Towed, Capabilities/Limitations	4-4
With Redeye (Stationary Asset Defense)	6-16
 Vulcan and Chaparral Mixed Defense	 6-18
Vulnerability	6-7
Warfare, Electronic	1-8, H-2
Warning Order, RSOP	A-2
Weapons	
Air Defense Artillery	1-3
Air Defense (Threat)	2-6
Field Artillery	1-3
Heliborne Infantry	1-3
Mechanized Infantry	1-2
Surface (OPSEC)	H-4
Tanks	1-2
Weapons Control Status	5-8, 5-9
Weapons Effect (Nuclear)	G-2
Weapons Systems, ADA	
Capabilities/Limitations	4-2
Organization	4-7
Weighted Defense	6-20
Wire Nets	J-8

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US Army Air Defense Artillery Employment, CHAPARRAL/VULCAN

Table of Contents

	PAGE
PART I DYNAMICS OF MODERN BATTLE	
Chapter 1 Facts About the Modern Battlefield	1-1
2 The Enemy in Modern Battle	2-1
3 The Third Dimension—The Air Threat	3-1
PART II HOW CHAPARRAL/VULCAN WILL COUNTER THE THREAT	
Chapter 4 Weapons and Organization	4-1
5 Command and Control	5-1
6 Employment Principles and Guidelines	6-1
7 Support of Offensive Operations	7-1
8 Support of Defensive Operations	8-1
9 Combat Service Support	9-1
Appendix A Reconnaissance, Selection, and Occupation of Position (RSOP)	A-1
B Night Operations	B-1
C Vulcan in the Ground Support Role	C-1
D Special Tactical Operations	D-1
E Airborne and Air Assault Operations	E-1
F Special Environments	F-1
G Operations in Active Nuclear, Biological, or Chemical (NBC) Environment	G-1
H Operations Security (OPSEC)	H-1
I Tactical Operations Center	I-1
J Communications	J-1
K References	K-1
Index	Index 1

“A commander of an antiaircraft subunit of the air defense troop units under the ground forces should have a good knowledge of the organization of the motorized rifle (tank) unit and subunits, their battle formations and missions, and the methods of carrying them out in offensive and defensive engagements. He should achieve constant coordination with the troops being covered.”

**V.A. Gatsolayev, Air Defense Subunits in
Combat, May 1974**

*(Considered best unclassified Soviet
source on air defense regulations and
tactics.)*

INDEX

FM 44-3

	Page
Actions Prior to Attack, Air Support (Threat)	3-8
Active Defense	8-1
Covering Force Area	8-3
Main Battle Area	8-3
Rear Area	8-3
ADA Support of Offense	7-3
ADA Survivability (OPSEC)	H-2
Aerial Reconnaissance (Threat)	3-6
Agent Characteristics, Chemical-Biological	G-7
Air Army (Threat)	3-7
Air Assault Operations	E-2
Airborne/Air Assault Division Vulcan Battalions	4-10
Airborne and Air Assault Operations	E-1
Air Assault	E-2
Airborne	E-1
Airborne Sensors	H-4
Aircraft, Army	1-7
Aircraft Attack Techniques (Threat)	3-10
Attack Helicopter	3-14
Fighter-Bomber	3-10
Aircraft Gunships	H-4
Air Defense Artillery (Modern Weapons)	1-3
Air Defense (Threat)	2-6
Air Defense Support of Offense	7-3
Air Defense Warnings and States of Alert	5-11
Air Defense Weapons (Threat)	2-6
Air Division (Threat)	3-7
Air Force Organization (Threat)	3-6

	Page
Air Regiment (Threat)	3-8
Air Support	1-6
Air Support of Maneuver Forces (Threat)	3-8
Air Support During the Attack	3-9
Air Support of Defensive Operations (Threat)	3-10
Air Support of the Field Artillery Preparation	3-8
Air Support of Offensive Operations	3-8
Air Support of Retrograde Operations	3-8
Air Support Prior to the Attack	3-8
Concept of Air Support	3-8
Support of the Exploitation	3-10
Air Threat	3-1
Air Threat Assessment (Threat)	6-7
Armed Helicopters (Threat)	3-5
Army Aircraft	1-7
Artillery Air Defense (Modern Weapons)	1-3
Artillery, Field (Modern Weapons)	1-3
Artillery (Threat)	2-4
Artillery Weapons (Threat)	2-5
Attack, Air Support (Threat)	3-9
Attack, Profiles Fighter-Bombers	3-11
Attack, Helicopter (Threat)	3-14
Background, The Threat Picture	3-1
Balance, Defense	6-13
Basic Principles, Employment	6-1
Integration	6-5
Mass	6-1
Mix	6-3
Mobility	6-4
Battalion, Communications	J-2
Battalion Organization	4-9
Battery Organization	4-8

Index 2

	Page
Biological and Chemical Operations	G-7
Agent Characteristics	G-7
Conditions	G-7
Detection	G-7
Protective Measures	G-7
Bounding Overwatch (Vulcan)	7-11
Built-Up Areas, Special Tactical Operations	D-1
Camouflage (OPSEC)	H-6
Capabilities, Weapons	4-2
Chaparral	6-18
Battery Defense	6-18
Organization	4-7
Platoon	6-17
System Capabilities/Limitations	4-2
With Redeye	6-17
Chaparral and Vulcans, Mixed Defense	6-18
Chaparral/Vulcan	
Battalion Air Defense Coordination Officer	5-5
Battalion, Nondivisional	6-11
Battalion, Supporting Defense	8-4
Battery Communications	J-6
Combat Service Support for Units	9-3
Units, Organization	
Battalion	
Airborne / Air Assault Division (Vulcan)	4-10
Divisional	4-9
Nondivisional	4-10
Battery	4-8
Platoon	4-8
Squad	4-7
Chemical and Biological Operations	
Agent Characteristics	G-7
Conditions of Use	G-7
Detection	G-7
Protective Measures	G-7
Class I Supplies	9-4
Class II, IV, VI, VII, and X Supplies	9-4

	Page
Class II, IV, VI, VII, and X Support	9-5
Class III Supplies	9-5
Class III Support	9-6
Class V Supplies	9-6
Class V Support	9-7
Combat Force Structure (Threat)	2-2
Combat Organization for Scenario	7-5
Combat, Radioelectronic (Threat)	2-11
Combat Service Support	9-1
Class I through X Supplies and Support	9-4 — 9-8
Division Support Command (DISCOM)	9-1
For Chaparral/Vulcan Units	9-3
Maintenance, Recovery, and Repair Parts	9-7
Medical	9-8
Command and Control	5-1
Air Defense Warnings and States of Alert	5-11
Divisional Battalions	5-4
Engagement Decision	5-12
Fire Distribution	5-11
Nondivisional Battalions	5-6
Rules of Engagement	5-7
Theater and Corps Air Defense	5-2
Communications	J-1
Battalion	J-2
Chaparral/Vulcan Battery	J-6
Headquarters and Headquarters Battery	J-5
Responsibility	J-1
Supplemental Early Warning	J-10
Communications Security (OPSEC)	H-7
Concept and Types of Offensive Operations	7-2
Concept of Air Support (Threat)	3-8
Conditions of Use, Chemical-Biological	G-7
Convoys or March Columns (Defense)	6-20
Corps ADA, Employment	6-10

Index 4

	Page
Countering The Threat, C/V	II-1
Countermeasures, Electronic	H-5
Covering Force Area (Defense)	8-3
Criticality	6-6
Deception (OPSEC)	H-1, H-5
Decision, Engagement	5-12
Defense	
Active	8-1
Chaparral/Vulcan Battalion, Support	8-4
Convoys or March Columns	6-20
Covering Force Area	8-3
Hawk Battalion	8-5
In Depth	6-15
Larger Asset	6-19
Main Battle Area	8-3
Mixed Defense (C/V)	6-18
Operations, Scenario	8-6
Rear Area	8-3
Redeye	8-5
Defense of Stationary Assets	6-12
Balance	6-13
Chaparral and Vulcan Mixed Defense	6-18
Chaparral Battery Defense	6-18
Chaparral Platoon	6-17
Chaparral with Redeye	6-17
Defense in Depth	6-15
Defense of a Larger Asset	6-19
Early Engagement	6-14
Mutual Support	6-14
Vulcan Battery Defense	6-15
Vulcan Platoon	6-16
Vulcan with Redeye	6-16
Weighted Defense	6-20
Defense of Units on the Move	6-20
Convoys or March Columns	6-20
Maneuver Forces	6-23
Defense Operations	8-6

	Page
Delivery Technique	3-11
Laydown	3-11
Popup	3-12
Desert Operations	F-2
Detection, Chemical-Biological Agents	G-7
Development of New Aircraft (Threat)	3-4
Development (Threat)	3-2
Direct Support	6-9
Direct Support Hawk Battalion	6-10, 8-5
Division Support Command (DISCOM)	9-1
Divisional Battalions--Command and Control	5-4
Doctrine, Threat, Air Defense	2-9
Dynamics of Modern Battle	I-1
Early Engagement	6-14
Early Warning Procedures (TOC)	I-5
Early Warning, Supplemental (Communications)	J-10
ECCM Techniques (OPSEC)	H-8
Electronic Countermeasures	H-5
Electronic Warfare	H-2
Modern Battlefield	1-8
Radioelectronic Combat Threat	2-11
Employment, FAAR	6-11
Employment, Points for Emphasis	6-24
Enemy	
Air Defense	2-6
Doctrine	2-9
Weapons	2-6
Air (Threat Assessment)	6-7
Artillery	2-4
Artillery Weapons	2-5
Combat Force Structure	2-2
In Modern Battle	2-1
Intelligence Collection Threat	H-1
Motorized Rifle Units	2-2

	Page
Radioelectronic Combat	2-11
Tank Units	2-3
Engagement Decision, Squad Leader's	5-9, 5-12
Environments, Special	F-1
Desert	F-2
Jungle	F-5
Mountain	F-6
Northern	F-4
Exploitation, Support of (Threat)	3-10
External Radio Nets	J-5, J-6
Facts About the Modern Battlefield	1-1
Field Artillery	1-3
Field Artillery Preparation, Air Support (Threat)	3-8
Fighter-Bomber, Attack Techniques, Threat	3-10
Fighting at Night	1-6
Fire and Maneuver (Vulcan)	7-12
Fire Distribution	5-11
Forward Area Alerting Radar	
Capabilities and Limitations	4-6
Employment	6-11
Functions, TOC	I-1
General Support	6-9
Ground Attack Aircraft (Threat)	3-4
Ground Support Role, Vulcan	C-1
Hawk Battalion (Direct Support)	6-10, 8-5
Headquarters and Headquarters Battery Communications	J-5
Heliborne Infantry	1-3
Helicopters, Armed, Threat	3-5
Helicopters, Attack Threat	3-14
Helicopter Gunships	H-4
Hostile Criteria	5-8

	Page
How ADA Supports the Defense	8-4
Chaparral/Vulcan Battalion	8-4
Hawk Battalion	8-5
Redeye	8-5
Human Intelligence	H-2
Infantry, Heliborne (Modern Weapons)	1-3
 Infantry, Mechanized (Modern Weapons)	 1-2
Information Security	H-1
Integration into Force OPSEC Plan	H-3
Integration, Employment	6-5
Intelligence Collection Threat, Enemy	H-1
Internal Radio Nets	J-5, J-6
Introduction of New Munitions (Threat)	3-5
Issue Orders, RSOP	A-3
Jungle Operations	F-5
Laydown Delivery Technique	3-13
Light and Noise Discipline	H-7
Low-Level Attack, Fighter-Bomber	3-10
Main Battle Area, Defense	8-3
Maintenance, Recovery, and Repair Parts	9-7
Maneuver Forces, Air Support (Threat)	3-8
Maneuver Forces, Defense of	6-23
Mass	6-1
Measures, (OPSEC)	H-5
Camouflage	H-6
Communications Security	H-7
Deception	H-5
ECCM Techniques	H-8
Light and Noise Discipline	H-7
Movement	H-8
Physical Security	H-9

	Page
Mechanized Infantry, Modern Weapons	1-2
Medical Combat Service Support	9-8
Missiles, Tactical Air-to-Surface (TASM)	H-4
Mix	6-3
Mixed Defense, Chaparral and Vulcan	6-18
Mobility	1-5, 6-4
Modern Battle, Dynamics of	I-1
Modern Battle, Enemy in	2-1
Modern Battlefield	1-1
Air Support	1-6
Army Aircraft	1-7
Characterization	1-1
Electronic Warfare	1-8
Fighting at Night	1-6
Mobility	1-5
Modern Weapons	1-2
Operations in NBC Battle	1-7
Modern Battle, Threat	2-1
Modern Weapons	1-2
Motorized Rifle Units (Threat)	2-2
Mountain Operations	F-6
Move Units to Position (RSOP)	A-4
Movement (OPSEC)	H-7
Movement Techniques -- How Vulcan Supports	7-8
Multichannel Circuits	J-10
Mutual Support	6-14
New Aircraft Development (Threat)	-34
New Munitions, Introduction (Threat)	3-5
Night Fighting	1-6
Night Operations	B-1
Nondivisional Battalions--Command and Control	5-6

	Page
Nondivisional C/V Battalion	4-10, 6-11
Northern Operations	F-4
Nuclear Battle	G-1
Nuclear, Biological, and Chemical Battle (Operations)	1-7
Nuclear Operations	G-1
Nuclear Protective Measures	G-4
Nuclear Weapons Effects	G-2
Occupy, Organize, and Improve Position (RSOP)	A-4
Offensive Operations, Air Support (Threat)	3-8
Offensive Operations, Support of	7-1
Offensive Operations, Types of	7-2
Operations in NBC Battle	1-7
Operations in Active NBC Environment	G-1
Operations, Night	B-1
Operations Security (OPSEC)	H-1
Enemy Intelligence Collection Threat	H-1
Integration into Force OPSEC Plan	H-3
Measures	H-5
Radioelectronic Combat (Threat)	H-3
Relation to ADA Survivability	H-2
Standing Operating Procedures	H-9
Suppressive Attacks	H-4
Ordnance Delivery, Fighter Bomber	3-10
Ordnance, Low-Level Attacks	3-13
Organization and Equipment (TOC)	I-1
Organizations (Threat)	2-2
Motorized Rifle Units	2-2
Tank Units	2-3
Organizing for Combat	6-6
Criticality	6-6
Direct Support (DS)	6-9
Enemy Air	6-7
General Support (GS)	6-9

	Page
General Support-Reinforcing (GS-R)	6-9
Offense	7-5
Operational Control and Attachment	6-10
Recuperability	6-7
Reinforcing (R)	6-9
Scenario	7-5
Vulnerability	6-7
Photographic Intelligence	H-2
Physical Security (OPSEC)	H-1
Plan Defense, RSOP	A-2
Plan Occupation	A-4
Plan Reconnaissance, RSOP	A-2
Platoon Organization	4-8
Popup Delivery Technique	3-11
Prepare for Occupation	A-4
Protective Measures (Chemical-Biological Agents)	G-7
Protective Measures (Nuclear)	G-4
Radio Nets	J-5, J-6
Radioelectronic Combat Threat (OPSEC)	2-11, H-3
Rear Area (Defense)	8-3
Reconnaissance, Selection, and Occupation of Position (RSOP)	A-1
Recuperability	6-7
Redeye Guided Missile System	4-5
Capabilities	4-5
Limitations	4-5
Supporting Defense	8-5
References	K-1
Responsibility, Communications	J-1
Right of Self-Defense	5-9
River Crossing, Retrograde	D-6
River Crossing, Special Tactical Operations	D-3

	Page
RSOP Sequence	A-3
Rules of Engagement	5-7
Applying	5-9
Hostile Criteria	5-8
Right of Self-Defense	5-9
Varying Weapons Control Status	5-9
Weapons Control Status	5-8
Security, Communications (OPSEC)	H-7
Select Positions, RSOP	A-3
Self-Defense, Right of	5-9
Self-Propelled Vulcan	4-3
Sensors, Airborne	H-4
Signal Intelligence	H-2
Signal Security	H-1
Special Environments	F-1
Desert	F-2
Jungle	F-5
Mountain	F-6
Northern	F-4
Special Tactical Operations	D-1
Built-Up Areas	D-1
River Crossing	D-3
SP Vulcan System	4-3
Capabilities	4-3
Limitations	4-4
Squad Leader's Engagement Decision	5-9
Squad Organization	4-7
Standing Operating Procedures (OPSEC)	H-9
States of Alert	5-11
Stationary Assets, Defense of	6-12
Supplies, Class I through X	9-4—9-7
Support	
Air	1-6
Chaparral/Vulcan Battalion	8-4

	Page
Defense, ADA	8-4
Defensive Operations	8-1
Defensive Operations (Threat)	3-10
Hawk Battalion	8-5
Offensive, ADA	7-3
Offensive Operations	7-1
Redeye	8-5
Retrograde Operations (Threat)	3-10
Suppressive Attacks (OPSEC)	H-4
Surface Weapons (OPSEC)	H-4
Survivability of ADA (OPSEC)	H-2
System Capabilities and Limitations	4-2
Tactical Air Force Organization (Threat)	3-6
Air Army	3-7
Air Division	3-7
Air Regiments	3-8
Tactical Air-to-Surface Missiles (TASM)	H-4
Tactical Operations Center	I-1
Functions	I-1
Organization and Equipment	I-1
Target Alerting and Early Warning Procedures	I-5
Tactical Operations, Special	D-1
Built-Up Areas	D-1
River Crossing	D-3
Tank Units (Threat)	2-3
Tanks (Modern Weapons)	1-2
Target Alert Data Display Set, Capabilities/Limitations	4-5
Target Alerting Procedures (TOC)	I-5
Theater and Corps Air Defense, Command and Control	5-2
Third Dimension, Air Threat	3-1
Threat	
Aerial Reconnaissance	3-6
Air Defense Doctrine	2-9
Air Defense Weapons	2-6
Artillery	2-4

	Page
Artillery Weapons	2-5
Combat Force Structure	2-2
Development	3-2
Modern Battle, the Enemy in	2-1
Motorized Rifle Units	2-2
Picture	3-1
Radioelectronic Combat	2-11
Tactical Air Force Organization	3-6
Threat (Air) Development	3-2
Threat and Corps Air Defense	5-2
TOC (Tactical Operations Center)	I-1
Towed Vulcan System	4-4
Capabilities	4-4
Limitations	4-4
Traveling Overwatch (Vulcan)	7-10
Traveling (Vulcan Support)	7-9
Types Ordnance, Low-Level Attack	3-13
Vulcan	
Battery Defense, Stationary Asset	6-16
Battalion, Airborne/Air Assault Division	4-10
Fire and Maneuver	7-12
Movement Techniques	7-8
Battalion Task Force (Offense)	7-8
Bounding Overwatch	7-11
Fire and Maneuver	7-12
Traveling	7-9
Traveling Overwatch	7-10
Organization (Chaparral/Vulcan) Units	4-7
Platoon Defense, Stationary Asset (Chaparral/Vulcan)	6-15; 6-17
Self-Propelled	
Capabilities	4-3
Limitations	4-4
Support of Battalion Task Force-Scenario	7-12
Support, Ground Role	C-1
Towed, Capabilities/Limitations	4-4
With Redeye (Stationary Asset Defense)	6-16
Vulcan and Chaparral Mixed Defense	6-18
Vulnerability	6-7

	Page
Warfare, Electronic	1-8, H-2
Warning Order, RSOP	A-2
Weapons	
Air Defense Artillery	1-3
Air Defense (Threat)	2-6
Field Artillery	1-3
Heliborne Infantry	1-3
Mechanized Infantry	1-2
Surface (OPSEC)	H-4
Tanks	1-2
Weapons Control Status	5-8, 5-9
Weapons Effect (Nuclear)	G-2
Weapons Systems, ADA	
Capabilities/Limitations	4-2
Organization	4-7
Weighted Defense	6-20
Wire Nets	J-8

Field Manual
No. 44-3

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Washington, DC, 30 September 1977

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US Army Air Defense Artillery Employment, CHAPARRAL/VULCAN

***This FM supersedes FM 44-3, 1 March 1973.**

i

The purpose of this manual is to show—in the setting of the modern battlefield—how Chaparral and Vulcan will be employed along with other air defense weapons as an integral part of the combined arms team.

This manual consists of TWO parts:

- Part I** describes the dynamics of the modern battlefield and portrays the threat we face in the next war—*the threat on the ground and from the air*.
- Part II** tells what Chaparral and Vulcan units can do and how they are employed—*the role of Chaparral and Vulcan in countering the air threat to the ground forces*.

This manual is unclassified; therefore, threat information and systems capabilities are, in some instances, discussed only in general, imprecise terms. Where detailed, precise planning is required, authoritative threat sources and classified publications should be consulted.

Users of this manual are encouraged to submit recommended changes or comments to improve the publication. Comments should be keyed to the specific page and line of text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be prepared on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to:

COMMANDANT
US Army Air Defense School
ATTN: ATSA-TD-LITW
Fort Bliss, Texas 79916

The wording in this manual should not be construed to discriminate between the sexes. In order to avoid a repetitious use of the terminology he/she, the terms he, him, and his are intended to include both the masculine and feminine gender. Any exceptions to this will be noted.

**US Army Air Defense Artillery Employment,
CHAPARRAL/VULCAN**

Table of Contents

		PAGE
PART	I DYNAMICS OF MODERN BATTLE	
Chapter	1 Facts About the Modern Battlefield	1-1
	2 The Enemy in Modern Battle	2-1
	3 The Third Dimension—The Air Threat	3-1
PART	II HOW CHAPARRAL/VULCAN WILL COUNTER THE THREAT	
Chapter	4 Weapons and Organization	4-1
	5 Command and Control	5-1
	6 Employment Principles and Guidelines	6-1
	7 Support of Offensive Operations	7-1
	8 Support of Defensive Operations	8-1
	9 Combat Service Support	9-1
Appendix	A Reconnaissance, Selection, and Occupation of Position (RSOP)	A-1
	B Night Operations	B-1
	C Vulcan in the Ground Support Role	C-1
	D Special Tactical Operations	D-1
	E Airborne and Air Assault Operations	E-1
	F Special Environments	F-1
	G Operations in Active Nuclear, Biological, or Chemical (NBC) Environment	G-1
	H Operations Security (OPSEC)	H-1
	I Tactical Operations Center	I-1
	J Communications	J-1
	K References	K-1

"A commander of an antiaircraft subunit of the air defense troop units under the ground forces should have a good knowledge of the organization of the motorized rifle (tank) unit and subunits, their battle formations and missions, and the methods of carrying them out in offensive and defensive engagements. He should achieve constant coordination with the troops being covered."

V.A. Gatsolayev, Air Defense Subunits in
Combat, May 1974

*(Considered best unclassified Soviet
source on air defense regulations and
tactics.)*

I **PART**

DYNAMICS of MODERN BATTLE

Success on the modern battlefield is dependent on the success of the combined arms task force composed of tanks and infantry/mechanized infantry and supported by tactical air, field artillery, and air defense artillery.

To win, the task force commander must **SEE** the enemy and the battlefield better than the enemy does. He must **MOVE** his forces to **SEE** and **FIGHT**. To **MOVE**, he must **SUPPRESS** the enemy weapons. Finally, he must **DESTROY** enough of the enemy to accomplish his mission. The Chaparral/Vulcan commander, in concert with other air defense commanders, provides the task force commander the necessary freedom from air attack to allow him to **SEE**, **SUPPRESS**, **MOVE**, **FIGHT**, **DESTROY**, and **WIN**.

To provide the task force commander an effective air defense, the Chaparral/Vulcan commander must know the dynamics of the battlefield; how the enemy fights; the weapons that are used; and, most of all, the enemy air threat to the combined arms task forces. By knowing the environment of the modern battlefield, the Chaparral/Vulcan commander will know how to best support the combined arms forces in winning.

CHAPTER 1

FACTS ABOUT the MODERN BATTLEFIELD

Opposing armies are now better able to locate and destroy one another than ever before. The rapid development and production of weapons of advanced destruction during the past quarter century have significantly changed the complexion of the modern battlefield as shown in recent wars. The employment of these lethal weapons by both sides provides an indication of the nature of war in the future. The next war will be characterized by:

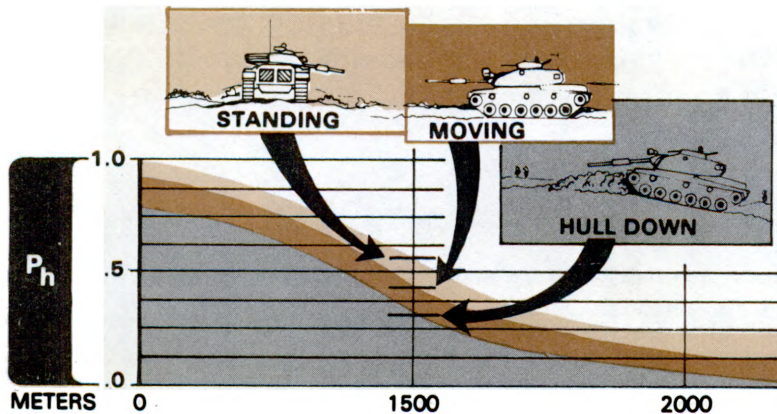
- An unprecedented array of sophisticated weapon systems.
- Heretofore unknown intensity in terms of materiel and weapon systems losses over short time periods.
- Increased complexity because of the number of sophisticated systems which must be integrated/interfaced to achieve full combat power.
- Engagement beginning at far greater distances because of new weapon systems having much greater range, accuracy, and lethality.
- High mobility, enabling rapid concentration of forces, because of the increase in proportion of armored and mechanized forces, and greater employment of the helicopter.
- The necessity of well-trained, highly proficient crews and units. Engagements will be of shorter duration; therefore, there will be less time to engage large numbers of highly mobile targets on the ground and high-performance aircraft in the sky.

<i>CONTENTS</i>	
	PAGE
Modern Weapons	1-2
Mobility	1-5
Fighting at Night	1-6
Air Support	1-6
Army Aircraft	1-7
Operations in Nuclear, Biological, and Chemical (NBC) Battle	1-7
Electronic Warfare	1-8

MODERN WEAPONS TANKS

All major armies of the world base their land combat power on the tank. It is likely to remain the most important weapon in the ground battle, characterized by cross-country mobility, armor protection, and

formidable firepower. Accuracy of modern tank guns provides a high probability of a first round hit and their lethality is such that, if the target is hit, it will probably be killed.

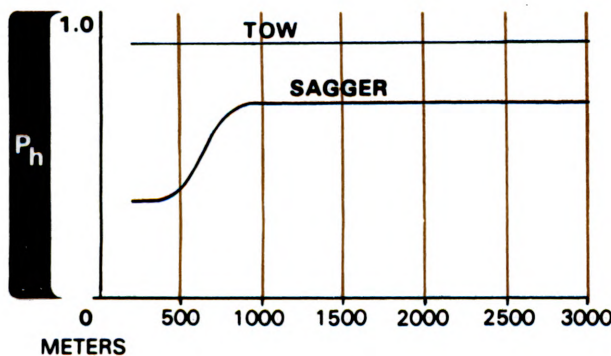


A Soviet-built T62 tank has a better than 50-50 chance of hitting a US M60A1 tank standing in the open at a range of 1,500 meters and just under a 50-50 chance of killing it. If the M60A1 is moving at 12 mph, it is 25 percent less vulnerable. If it is hull down so that all but the turret is covered, it is 50 percent less vulnerable.

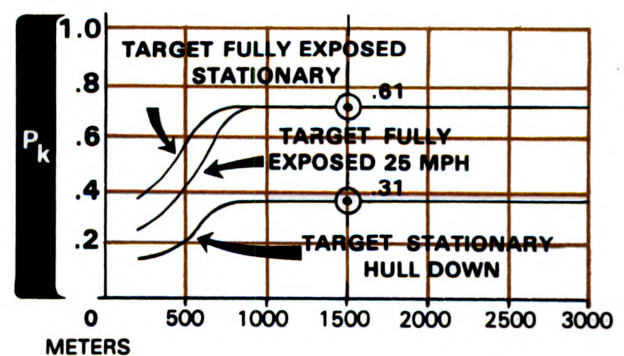
MECHANIZED INFANTRY

The infantry is significantly more capable than its WW II counterpart. It is sufficiently mobile to keep pace with armored warfare and is equipped with a broad spectrum of weapons ranging from rifles to antitank guided missiles (ATGM), such as the US TOW and Soviet-built Sagger. These

ATGMs have a very high hit and kill probability against point targets at long ranges. The capabilities of mechanized infantry complement armor and are integrated with armor forces on the battlefield.



Probability of First Round Hit, Tow and Sagger.



Probability of Kill, Sagger Shooting at M60A1.

HELIBORNE INFANTRY

The greatest advances in infantry mobility have been brought about by the emergence of the helicopter as a fully capable member of the combined arms team. Its advances in speed, operating range, airworthiness, and maintainability enable

the helicopter to deploy large numbers of troops and weapons quickly throughout the battlefield and over terrain that would limit the advance of armored and mechanized forces.

Heliborne infantry can move about the battlefield 20 times as fast as foot-mobile troops and 8 times as fast as mechanized forces.

INFANTRY SQUAD	TIME TO COVER 30 KM	DISTANCE COVERED IN 1 HOUR
WALKING	5 HRS	6 KM
APC	2 HRS	15 KM
AIRMOBILE	15 MIN	120 KM

FIELD ARTILLERY

In the years since WW II, artillery development has produced new models of guns and rocket launchers, gradually modernizing artillery systems. Maximum ranges have increased. By 1975, Threat direct support artillery had attained ranges of almost 40 kilometers with rocket-assisted projectiles. New explosives and munitions have greatly increased the lethality per shell. Improved conventional munitions,

compared to ordinary high-explosive rounds, provide up to four times the amount of casualty effect against personnel targets. In the early 70s Threat forces recognized the mobility limitations of towed artillery and began to increase their inventories of self-propelled guns and rocket launchers to support their doctrine of fast, deep offensive operations.

AIR DEFENSE ARTILLERY

Since WW II, the range, accuracy, and lethality of air defense weapons have increased dramatically. Perhaps the most striking air defense development is the incorporation of sophisticated air defense weapons within maneuver units. Soldier-operated, surface-to-air missile systems such as the US Redeye and Soviet-built SA-7 are relatively simple to use and, although small and light, have high hit

probabilities against low-flying, high-performance aircraft and helicopters. These weapons, along with other air defense artillery guns and missiles available in the divisional area, form an air defense network capable of engaging aircraft over the battle area forward and behind the area of contact. Moreover, these weapons are mobile and capable of moving with maneuver units to provide a continuous air defense umbrella.

INCREASED EFFECTIVENESS OF AIR DEFENSE WEAPONS

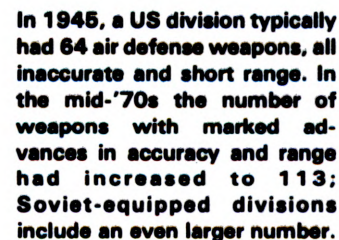
ALTITUDE IN FEET

RANGE IN METERS

CURRENT COVERAGE—GUN AND MISSILE

WW II COVERAGE ALL GUN

Altitude (Feet)	WW II Coverage Range (Meters)	Current Coverage Range (Meters)
0	~12,000	~35,000
10,000	~12,000	~35,000
20,000	~12,000	~35,000
30,000	~12,000	~35,000
40,000	~12,000	~35,000
50,000	~12,000	~35,000



1-4

MOBILITY

Modern armies are largely mechanized. Tank and infantry combat vehicles of the maneuver elements give them a degree of mobility not available to armies of the past. Artillery in US armored and mechanized divisions is entirely self-propelled and Threat artillery is moving in that direction. The advantages which accrue to armies with heightened mobility capabilities are many. Mobility enables the commander to:

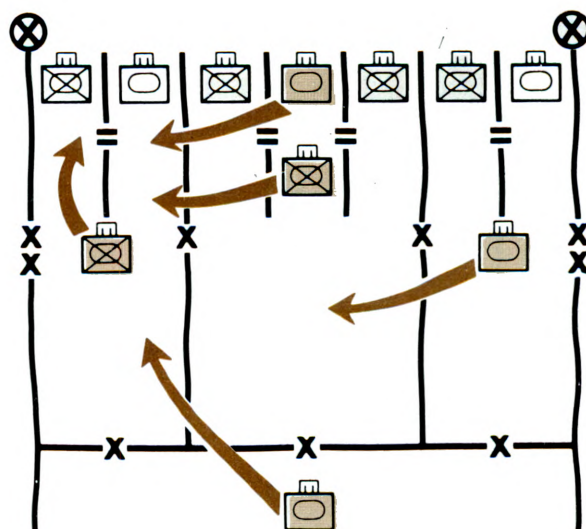
- Change the ratio in his favor so that his units have the best chance of winning by concentrating overwhelming combat power at the critical place and time.
- Seize the initiative from the enemy, thus increasing the chance of winning.

EXAMPLE

- In the offense, mobility enables the commander to concentrate forces quickly against enemy weak points and penetrate the enemy defensive system.
- In the defense, mobility enables the commander to quickly mass his combat power against an enemy main attack, thus changing the odds so that he can break the attack and defend successfully by destroying massed armor, combat vehicles, and enemy weapons.

Mobility allows the commander to quickly concentrate his forces, facilitating full integration of all elements of his combat power. In the defense the rapid concentration of forces is essential to winning. To win outnumbered, concentration at the critical

time and place is all important. In some instances maneuver elements may be required to make long moves. As an example, in the conduct of active defense, a battalion on the right flank of a division may be required to reinforce an element operating on the left flank of the division.



Mobility Allows Concentration.

In such an instance, task forces may be required to move long distances very rapidly.

The helicopter has added a new dimension to battlefield mobility which enables commanders to more rapidly concentrate forces against a threat; e.g., dismounted ATGM teams against enemy armor. If the enemy attacks with a regiment, we must concentrate the tank killing ATGM teams of three or four company teams to stop him—one company team will not be able to do the job. Rapid concentration of forces and superior firepower are required to do it.

FIGHTING AT NIGHT

Thirty years ago the most advanced aids to night vision were infrared devices which required an infrared light source to illuminate a target area. Range was limited and an enemy equipped with infrared detectors could see the light source.

Ten years ago image intensifiers became available which operated with existing light—starlight, moonlight, and skyglow from cities or battlefield fires. At about the same time, the US Army fielded crew-served weapon sights using image intensifiers with capabilities of 1,200 meters under starlight and 2,000 meters under moonlight. For the same weight, these devices had over four times the range capability of earlier infrared equipment. Additionally, image intensifiers are completely passive—it is impossible for an enemy to detect them in use.

Today, this technology has led to small night vision aids which enable tanks, mechanized infantry, and helicopters to maneuver and engage the enemy at night, much as they can during daylight.

Thermal imagery sights have also been developed, entirely passive like the image intensifiers, but which detect heat radiation and construct images therefrom. These sights are particularly useful for penetrating smoke, fog, snow, or rain clutters, light foliage, and camouflage. They are relatively lightweight and can function during daylight or darkness. The range of these sights corresponds to the range of the weapons on which they are used.

Threat forces stress night fighting skills. They seek to take advantage of reduced visibility to achieve surprise, bypass defensive positions, and destroy or disrupt command, control, and support systems.

The force which can operate at night as it does in daytime—making full, effective use of cover, concealment, suppressive fires, and night vision equipment—can defeat the force which does not.

AIR SUPPORT

Three decades of experience have changed the concept of air support. In some air forces, including those of the United States, aircraft are dedicated to the support of the maneuver arms, recognizing the fact that the modern battlefield will provide an abundance of targets that can be destroyed or neutralized by close air support.

Modern tactical aircraft are far more powerful than those of 1945. The P47 of WW II, for example, could fly 100 miles to a target, stay for about 30 minutes, deliver .50 caliber machinegun fire and two 250-pound bombs, and then had to return to home base. Today's USAF A10 carries 30 times as much ordnance (about 16,000 pounds of cannon ammunition, bombs or missiles). It can fly to a target 250 miles away, stay for 2 hours, deliver its ordnance, and return home. In addition, the ordnance is much more lethal. For example, the GAU-8 automatic cannon in the A10 fires a 1.5-pound projectile capable of destroying tanks, armored personnel carriers, and other armored vehicles. Threat aircraft have similar capabilities.

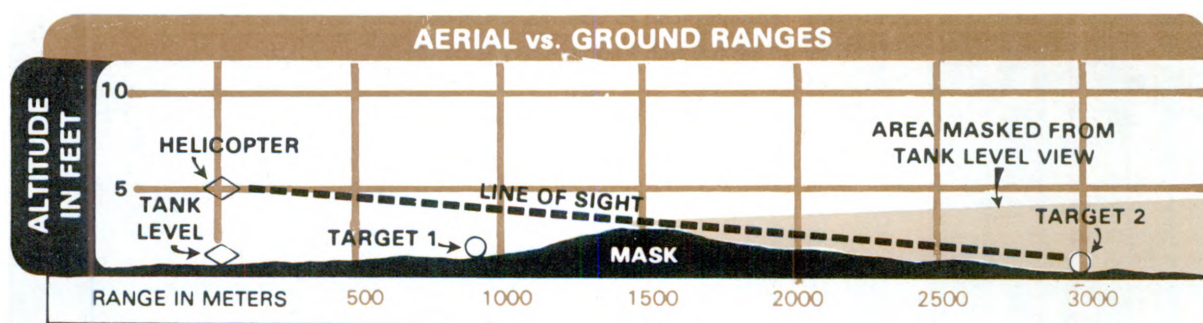
Threat forces view air strikes as an extension of their artillery capability. They devote great emphasis to attacks against preplanned targets such as tactical nuclear delivery systems, air defense artillery systems, command and control systems, and artillery support and maneuver elements within the tactical and immediate

operational depths. Tactical aircraft provide a standoff capability with the employment of guided missiles and bombs which have a high degree of accuracy and limit the exposure time of the attacker to opposing air defenses. Antiradiation missiles (ARM) are capable of homing in on electronic emissions from acquisition and tracking radars as well as other emitting sources.

ARMY AIRCRAFT

The high mobility and armor-killing capability of attack helicopters (AH) make

them unique to the battlefield. Available weapon systems (such as TOW on the Cobra or Sagger on the Hind) enable them to defeat the entire spectrum of battlefield targets. The AH can fire at extended ranges more frequently than their ground counterparts because they are able to popup over terrain masks to increase both target acquisition and range. A difference of only about 5 feet in elevation could convert an 800-meter shot on the ground to a 3,000-meter kill from the air.



OPERATIONS IN NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) BATTLE

With the advance of nuclear technology, many armies will soon be able to employ nuclear weapons. US forces must be prepared to fight and win when nuclear weapons are used. While the destructive power of nuclear weapons makes the battlefield an even more dangerous place than it might be without them, it is important to remember that:

Nuclear weapon effects must be exploited by ground forces to be truly useful.

Nuclear weapon effects are degraded considerably by errors in target location and weapon delivery. The ability to move rapidly can also preclude the enemy from locating maneuver forces accurately enough to make an effective nuclear strike.

Armor protection and mobility are good defenses against nuclear weapons.

The United States has renounced the use of biological agents and would not use chemical weapons first. However, other armies of the world possess these weapons and are prepared to use them. Introduction of these weapons could severely reduce mobility and the ability to concentrate force—unless US forces understand the effects of biological and chemical weapons, and how to fight in a biological and chemical environment.

The force that can continue to operate effectively in the NBC environment will have a significant advantage over a force that cannot.

ELECTRONIC WARFARE

Increased military use of the electromagnetic environment has added a new dimension to battle—electronic warfare (EW). The lessons of WW II, and every military action since, stress that combat power is useless unless it can be brought to bear quickly—at the right point, and at the right time. In the future, an invisible, yet crucial struggle will be waged to attack or defend the means of command—the key to concentrating forces—or to suppress or to deceive weapons and surveillance systems. Countermeasures will be met by countermeasures. Battles may be won or lost by the fight in this medium.

The effects of EW can result in significant casualties among an enemy force. In the attack and defense, EW can locate and jam enemy communication emitters associated with CPs, maneuver battalions, and fire request nets, thereby disrupting command and control, movement of reserves, and reducing effective fire support. Other enemy emitters associated with acquisition systems, such as radar and lasers, are equally vulnerable to total disruption through jamming and deception. EW can reduce friendly casualties by locating attacking enemy elements so they can be fired upon, and by countering enemy target acquisition and jamming.

Any commander is prone to defeat, whatever his strength in numbers and weapons, if EW denies him the means to convey orders, provide for fire support, or to arrange for logistics and administration. EW is now a form of combat power.



I

CHAPTER 2

THE ENEMY IN MODERN BATTLE

The potential enemy the US Army faces today poses a severe threat. We are looking at a modern, mobile, well-balanced fighting force which outnumbers us in men and weapons, and is trained to seize and keep up a high tempo of offensive action. Even his defensive doctrine is based on overall offensive strategy. Defense is thought of as only a temporary expedient while waiting for an opportunity for offensive action or as an economy of force measure to support the overall offense.

In the offense, the enemy envisions concentration of numerically superior forces and firepower for a combination of frontal attacks, envelopments, and deep penetrations into the rear areas by armor-heavy, combined arms forces. The Threat consistently adheres to certain principles in support of his doctrine of fast-moving, offensive action. Threat forces:

- Seek surprise at all times to paralyze the enemy's will to resist, and deprive him of the ability to react effectively.
- Mass combat power in decisive areas for the minimum time necessary to rupture enemy defenses.
- Bypass strongly defended areas and leave them for following echelons.
- Use massive artillery support including mortars, multiple rocket launchers, missiles, guns, and tanks for all operations.
- Give high priority to destruction of enemy nuclear, anti-tank, air defense, and command and control systems.

CONTENTS

	PAGE
Combat Force Structure	2-2
Motorized Rifle Units	2-2
Tank Units	2-3
Artillery	2-4
Air Defense	2-6
Radioelectronic Combat	2-11

- Mass up to 100 tubes per kilometer for breakthrough attacks.
- Conduct all operations under a dense and interlocking air defense umbrella.
- Employ electronic warfare as a primary element of combat power.

- Rely on speed and mobility to punch through defenses at weakly defended positions and rapidly advance deep into rear areas.
- Use tactical air support to achieve air superiority and conduct air strikes in enemy rear areas.
- Accept heavy losses and the isolation of units in the assault.
- Emphasize speed in overcoming natural and manmade obstacles.
- Conduct operations 24 hours per day under any and all environmental conditions.
- Initiate defensive operations only to gain time or economize forces in preparation for offensive action.

COMBAT FORCE STRUCTURE

The combined arms concept is inherent in Threat force organization. Motorized infantry and armor consistently operate together; operations are usually supported by massive, well-planned artillery fires and heavy air defense coverage. Unit structure is designed to be readily adapted to changing combat requirements by the attachment of supporting units.

Forces are employed in echelon in both offense and defense. Each tactical level down to battalion decides how many echelons will be required for a given operation, based on the situation. In the offense, two echelons are normal. As a unit attacks in echelon, each with a preplanned scheme of maneuver and objective, the offensive appears to the defender to be a series of attacking waves. The first echelon is the assault unit which attempts to smash through enemy defenses. The second echelon is the follow-up element used to mop up bypassed enemy units, to maintain the momentum of the attack, and to act as an exploitation force.

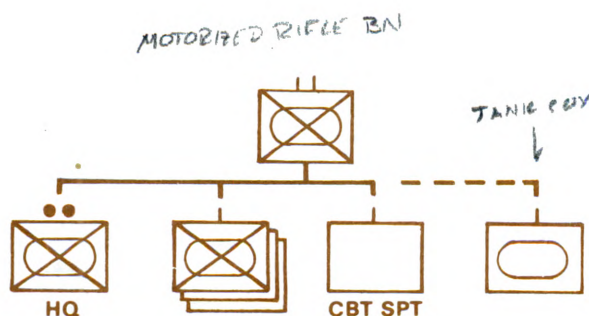
The Threat commander normally maintains a reserve; the size of the reserve will vary, but is usually relatively small compared to the first and second echelons. It is usually comprised of antitank elements and is retained as the commander's contingency force which he uses to replace destroyed units, to repel counterattacks, and to provide security against airborne/heliborne assaults and partisan operations.

MOTORIZED RIFLE UNITS

Motorized rifle troops are considered by the Threat to be a basic and most versatile arm in his armed forces. He considers these units to be capable of employment under any conditions or environment at any time. Primary missions for motorized rifle elements of the combined arms team are seizing and consolidating terrain in the offense and defending terrain in the defense. Motorized rifle units are very rarely employed without strong artillery, tank, and engineer support.

TANK UNITS

Tanks may be employed at all echelons from platoons and companies in direct support of motorized rifle troops. They may be used in both direct and indirect fire roles. In offensive operations, tanks are employed in mass to seize deep objectives before the enemy is able to reorganize for defense or counterattack. In defense, the majority of a unit's tanks are held in reserve to be used in counterattacks, to destroy enemy penetrations, and to resume the offensive.



WEAPONS

ANTIARMOR

	BMP <i>APC</i>	32*
	SAGGER Launcher	34*
	SPG-9	2
	RPG-7	27
	Tank	13

INDIRECT FIRE

Mortar, 120-mm	6
----------------------	---

INFANTRY SMALL ARMS

Rifles AKM 7.62-mm	356
LGM PK 7.62-mm (BMP)	64
COAX MG 7.62-mm (BMP & T-62A)	45
HMG 12.7-mm TK Mtd	13
Sniper Rifle SVD 7.62-mm	9

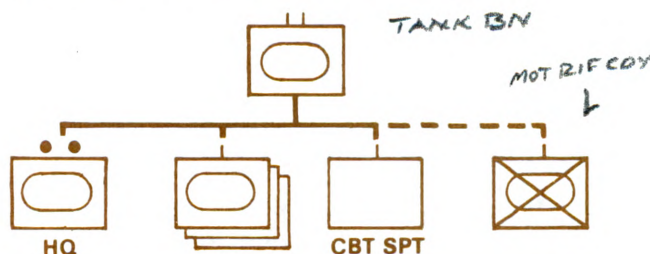
AIR DEFENSE

SA-7 Launcher	9**
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* One SAGGER launcher and one 73-mm smooth bore gun with automatic loader mounted on each BMP. Each BMP carries five SAGGERS—one mounted and four in the basic load. There are also two man-pack launchers in the battalion, each with two missiles.

** Deployed in groups of three from the battalion as the situation requires.

**Threat Motorized Rifle Bn
Reinforced W/Medium Tank Co.**



WEAPONS

ANTIARMOR

	BMP <i>APC</i>	10
	SAGGER Launcher	10*
	RPG-7	9
	Tank	31

INFANTRY

Rifles AKM 7.62-mm	212
LGM PK 7.62-mm (BMP)	20
COAX MG 7.62-mm (BMP & T-62A)	41
HMG 12.7-mm TK Mtd	31

AIR DEFENSE

SA-7 Launcher	9
---------------------	---

* One SAGGER launcher and one 73-mm smooth bore gun with automatic loader mounted on each BMP. Each BMP carries five SAGGERS—one mounted and four in the basic load.

**Threat Tank Bn Reinforced W/
Motorized Rifle Co.**

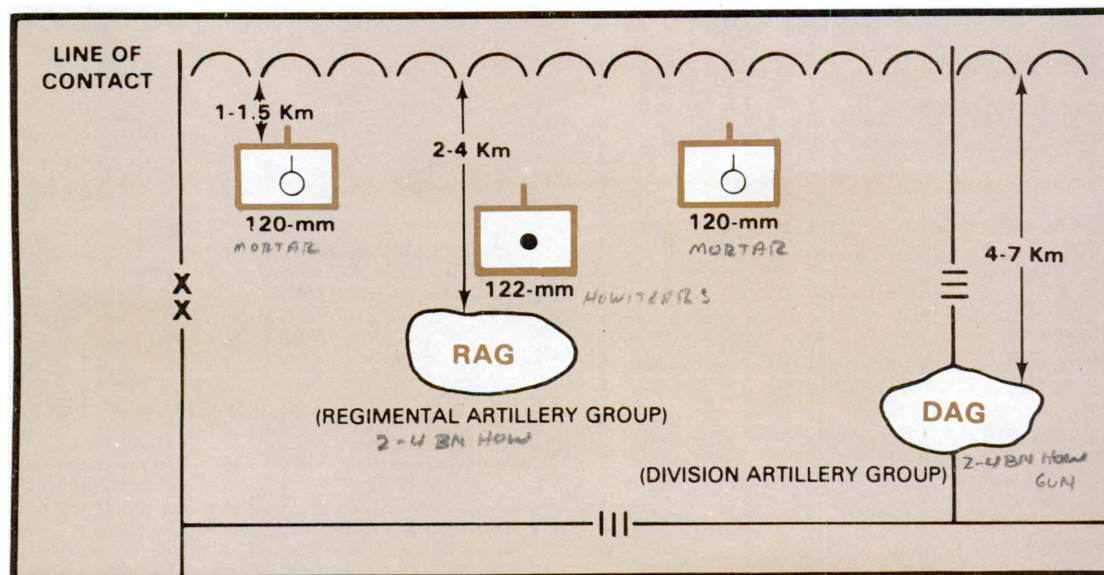
ARTILLERY

Since WW II, Threat forces have relied increasingly on massed quantities of artillery and today it is employed at all tactical echelons. Threat artillery support is characterized by area saturation in massive barrages. The concept of "fire strike"—severe and intense bombardment by a multiple assortment of artillery weapons designed to defeat the enemy with a minimal use of motorized rifle or tank troops—is employed. Direct fire is used to the maximum possible extent on targets of opportunity and fortifications, and in support of armored and motorized attack.








Threat artillery is combat organized at army, division, and regimental level by combining organic assets with assets from higher headquarters. Each of these groups, army artillery group (AAG), division artillery group (DAG), and regimental artillery group (RAG), is immediately responsive to the level of command to which it is provided. Groups normally contain two to four battalions. Each of the various types

are flexible in their organization and are readily alterable during an operation if the situation demands. Fire planning and the execution of fire support for the AAG, DAGs, and RAGs are initially centralized at army level at the beginning of the battle, then successively decentralized as the battle progresses. Decentralization begins at the RAGs, then proceeds to the DAGs. This procedure is designed to enable Threat commanders to weight their artillery support toward the main effort as the situation requires.

Indirect and direct fire support for first echelon battalions in the attack is provided by the organic 120-mm mortar batteries in each motorized rifle battalion and an accompanying battery of 122-mm howitzers. Massive indirect fires are provided by the RAG consisting of from two to four battalions of 122-mm and 152-mm howitzers. The DAG will have from two to four battalions of 130-mm guns and 152-mm gun-howitzers and will provide fires for support of the attack and counterbattery fires.



Threat Artillery Deployment.

WEAPON	RANGE - m	RATE OF FIRE	ASSIGNMENT
 120-mm MORTAR (M-1943)	5,700	15 RDS/MIN	BATTALION
 122-mm HOWITZER (D-30)	15,300	7 to 8 RDS/MIN	DIVISION
 152 mm HOWITZER (D-20)	17,000	4 RDS/MIN	DIVISION
 130-mm FIELD GUN (M-46)	27,490	5 to 6 RDS/MIN	ARMY
 180-mm GUN HOWITZER (S-23)	30,000	LESS THAN 1 RD/MIN	ARMY
 FROG-7	70,000	GUIDANCE	DIVISION
		FREE FLIGHT	
 Multiple Rocket LAUNCHER (BM-21)	20,500	FIN STABILIZED SLOW SPIN	DIVISION

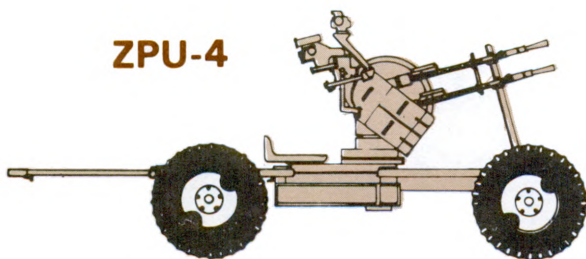
Representative Artillery Weapons.

AIR DEFENSE

WEAPONS

Threat forces have developed and deployed a great number of mobile surface-to-air missiles and conventional air defense guns for air defense of their field units. This mix of guns and missiles provides a mobile umbrella which accompanies each echelon of the Threat armies, including forward deployed battalions. As new air defense systems are introduced into the Threat forces, the older systems are still retained in the active weapon inventory. Threat air defense weapons include:

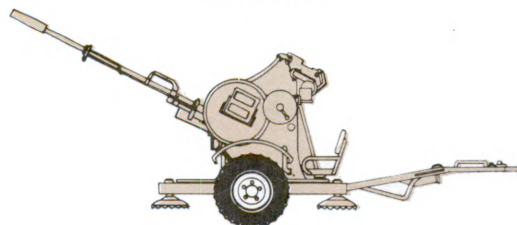
ZPU-4



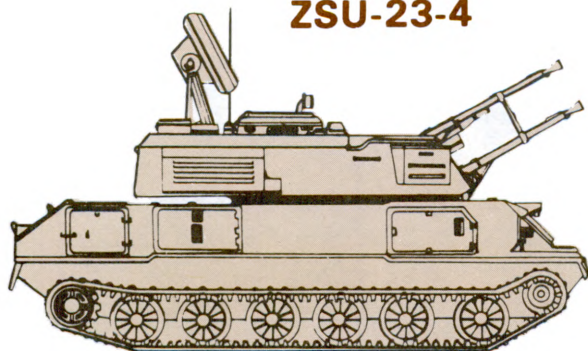
This anti-aircraft (AA) weapon has four 14.5-mm heavy machineguns with a combined cyclic rate of fire of 2,200 to 2,400 rounds per minute. It traverses 360° and with its optical fire control has a tactical AA range of 1,400 meters. This weapon is used by motorized rifle regiments of tank and motorized rifle divisions. It is currently being replaced by more modern equipment.

This anti-aircraft system consists of two 23-mm cannons, which in the cyclic mode fires a maximum of 2,000 rounds per minute. The ZU-23 traverses 360° and with its optical fire control has a tactical AA range of 2,500 meters. Against thin-skinned armor targets, it has a ground combat range of approximately 1,000 meters. This weapon is found in motorized rifle regiments of tank and motorized rifle divisions.

ZU-23



ZSU-23-4

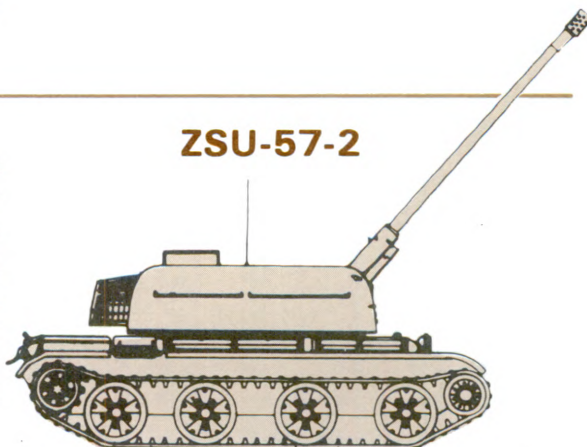


This anti-aircraft system has four 23-mm cannons with a cyclic rate of fire up to 4,000 rounds per minute; the maximum practical rate of fire is 2,000 rounds per minute. It traverses 360° and, with the gun dish radar, has a tactical anti-aircraft range of 3,000 meters. Using optical sights, tactical anti-aircraft range is 2,500 meters. The ZSU-23-4 is effective up to approximately 1,000 meters against thin-skinned ground targets. The ZSU-23-4 is mounted on a modified PT-76 armored vehicle chassis, carries a four-man crew, and can fire on the move at speeds up to 25 kph.

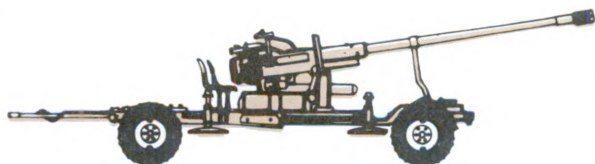
The ZSU-23-4 can be used in conjunction with the SA-9 GASKIN. It is found in tank and motorized rifle regiments of tank and motorized rifle divisions. It is integrated into the attack formation of tank units.

This AA system has two 57-mm cannons with a combined rate of fire of 210 to 240 rounds per minute. It traverses 360° and has a tactical range of 4,000 meters. The ZSU-57-2 is mounted on a modified T-54 tank chassis and carries a 5-man crew. Fire control is optically directed. The ZSU-57-2 is presently being replaced by more modern equipment. It is located in tank regiments of tank and motorized rifle divisions.

ZSU-57-2

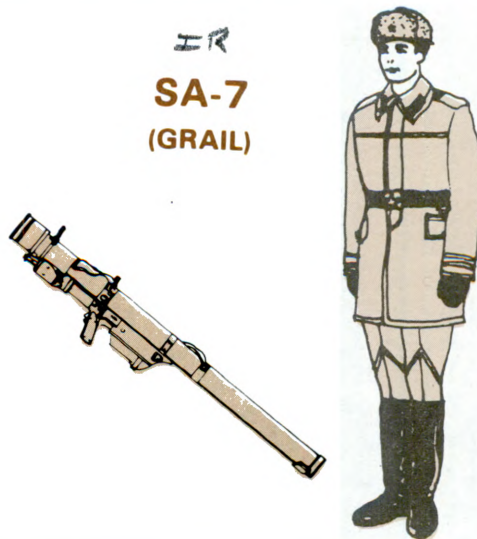


S-60

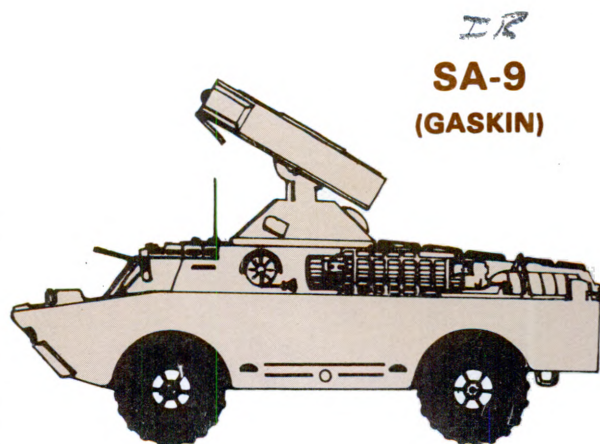


This antiaircraft system has one 57-mm cannon with a cyclic rate of fire of 105 to 120 rounds per minute. It traverses 360° and, when directed by the off-carriage FLAP WHEEL radar, has a tactical AA range of 6,000 meters. The tactical AA range with on-carriage optical sights is 4,000 meters. Normally, six S-60 guns with associated fire control equipment constitute a battery. This system is found in antiaircraft regiments of tank and motorized rifle divisions.

This man-portable air defense (MANPAD) missile system is 1.2 meters long. The missile, which is fired from a shoulder launcher, has passive infrared homing guidance and an HE warhead. A solid fuel booster and sustainer propel the GRAIL to a maximum slant range of approximately 3.5 kilometers. It can be fired from the ground or a vehicle and may be used against aircraft flying at altitudes from approximately 50 to 3,500 meters. Nine SA-7 GRAIL launchers are found in each tank and motorized rifle battalion and are further assigned in groups of three to company level.

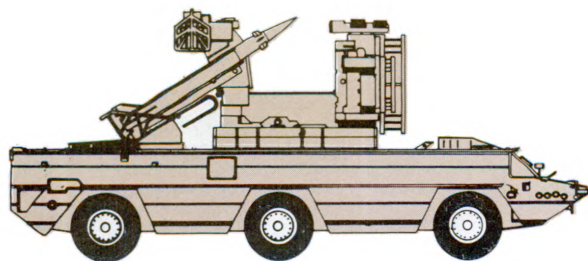
 IR
SA-7
(GRAIL)


This short-range air defense (SHORAD) system has been recently introduced into the Threat inventory. It is transported on a modified BRDM-2 amphibious armored vehicle which carries a probable crew of four. The SA-9 has a slant range of approximately 5 kilometers and an altitude capability of about 5,000 meters. The missile has an infrared seeker, an HE warhead, and probably is powered by a solid propellant. Four missile canisters, each with one missile, are normally carried on the launcher turret. The SA-9 GASKIN can be used in conjunction with the ZSU-23-4 at regimental level.



CG

SA-8
(GECKO)

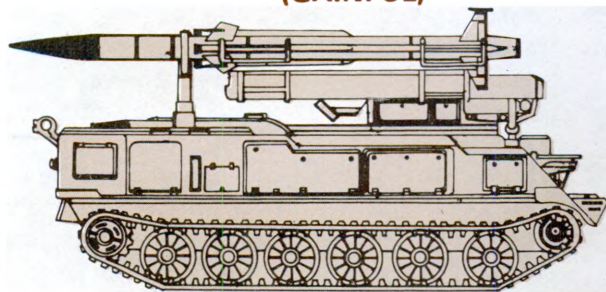


The SA-8 SHORAD missile operates by command guidance and is effective at altitudes from 50 to 6,500 meters. It is fully self-contained with acquisition, tracking, and two missile guidance radars mounted on a six-wheeled, amphibious vehicle. Four missiles are carried in an integrated mount. The system contains an electro-optical tracker, probably television. With a slant range of approximately 10-15 kilometers, the highly mobile SA-8 can provide close support to armored and mechanized forces. The SA-8 is a new weapon system now being introduced into the Threat inventory. It will probably be assigned to Army level.

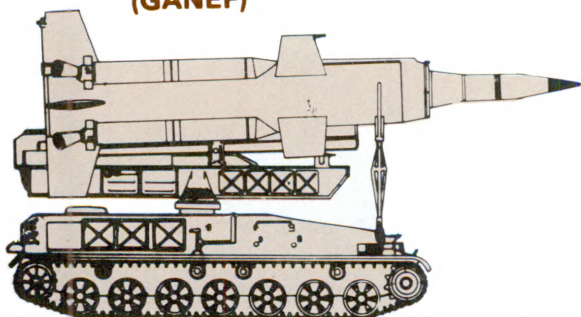
CG

SA-6
(GAINFUL)

This air defense missile has a slant range of about 30 kilometers. It is powered by an integral solid rocket/ramjet system and is command guided by the STRAIGHT FLUSH fire control radar. The missile carries an HE fragmentation warhead and can be employed against aircraft flying at altitudes from about 100 to 11,000 meters. This system was used effectively during the 1973 Middle East War. It is normally assigned to Army level.

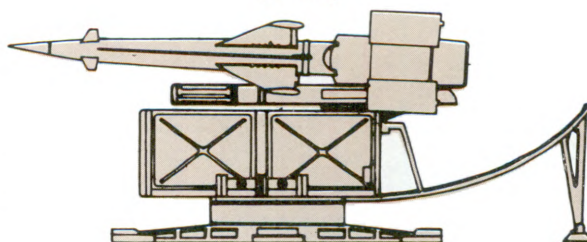


CG
SA-4
(GANEF)



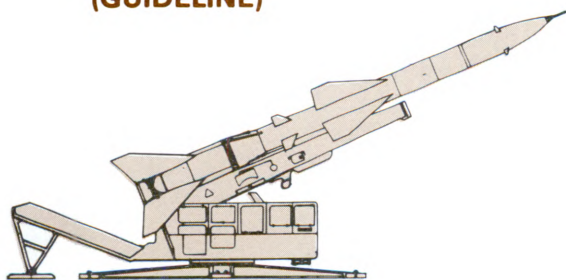
This air defense missile has a slant range of approximately 70 kilometers. The GANEF has command guidance to a maximum altitude of about 27,000 meters. The missile is powered by four solid fuel boosters with canted nozzles and a ramjet sustainer. It carries an HE proximity-fuzed warhead. The SA-4 system is assigned at Army level.

CG?
SA-3
(GOA)



This air defense missile probably is command guided. The missile has an effective range of about 24 kilometers. Powered by a two-stage solid fuel booster and a solid fuel sustainer, the missile can carry its HE proximity-fuzed warhead to altitudes in excess of 13,000 meters. This system is assigned at Army level.

RG
SA-2
(GUIDELINE)



This high-to-medium altitude air defense (HIMAD) missile has a slant range of approximately 40 kilometers. It has two stages, a solid fuel booster and a liquid fuel rocket sustainer that boosts its 130 kilogram HE warhead to a maximum altitude of about 27,000 meters. The typical SA-2 site consists of six launchers arranged in a star-like configuration around the FAN SONG radar guidance equipment. The SA-2 system is assigned at Army level.

DOCTRINE

To deny enemy use of airspace above and adjacent to areas of operations, the Threat doctrine advocates saturation of the airspace, from low to high altitudes, using an integrated system of conventional AA guns and SAMs. The Threat relies on vehicle-mounted SAMs and mobile guns to protect its

fast-moving tank and motorized rifle units. These are augmented by interceptor aircraft and electronic countermeasures units.

Air defenses are established to provide both area and point protection for troops and objectives. Area coverage is provided by

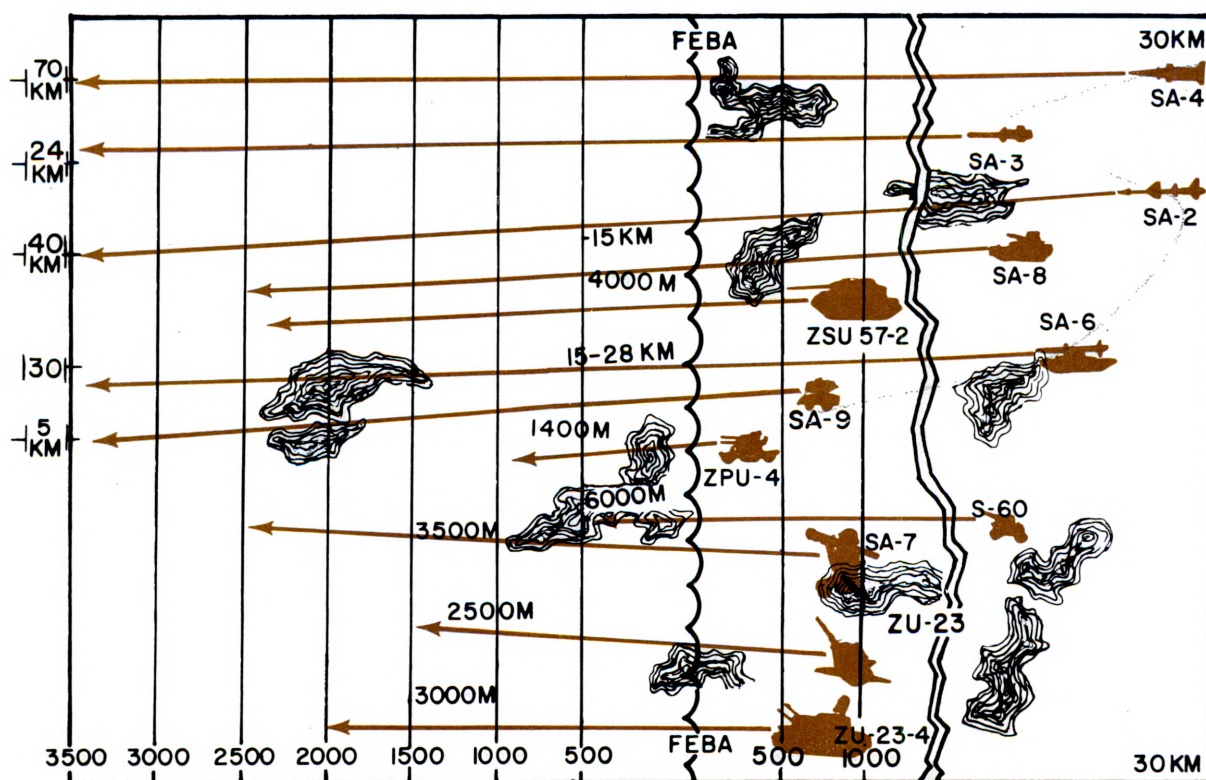
AREA

SAM systems and point protection is provided by divisional and regimental light air defense weapons.

SAM units normally move as a battery and may be integrated into a march column or moved along separate routes to insure adequate coverage of the column. AA guns also normally move as a battery and are integrated into the column. Short-range SAMs are also integrated by individual piece into march columns to insure adequate, continuous air defense protection for the entire column. These weapons can fire on the move if the column is attacked. Additionally, machineguns mounted on vehicles and individual weapons will engage low-flying aircraft which attack the column. During long halts, AD weapons usually disperse

slightly to provide 360° protection and still remain able to move rapidly back into the march column.

Air defense units will be employed, by battery, in direct support of engaged maneuver elements and will also protect headquarters elements, support activities, and other critical assets in rear areas. Regimental AD weapons (e.g., SA-9, ZSU-57-2, ZSU-23-4, ZU-23, and ZU-4) are also employed as individual weapons and are cross attached to operate together in support of engaged rifle and tank battalions. These systems receive missions from the battery commander in addition to monitoring the air warning net. They will be deployed well forward and their primary targets will be close support aircraft and attack helicopters.



Missile and Antiaircraft Systems Deployed in Forward Area.

RADIOELECTRONIC COMBAT

Radioelectronic combat is used by the Threat to selectively deprive adversaries of control of the electromagnetic environment. Threat forces place a high priority on the use of radioelectronic combat to:

- Collect information on our forces.
- Locate the positions of our radios, radars, and other electronic emitters.
- Deceive the operators of our radios, radars, and other electronic emitters.
- Jam our electronic emitters.

Electronic emissions can often be monitored at many times the effective range of the transmitters.

By examining both the electronic signature and the content of our transmissions, the Threat uses *electronic intercept operations* to collect valuable intelligence information, such as:

- The size and composition of our forces.
- The type of electronic emitters being used by our forces.
- The electronic order of battle of our forces.
- The location of our emitters.

The Threat uses *direction finding* techniques (see appendix A) to locate the positions of our electronic emitters. Using these techniques, he can locate to within 50

meters the positions of strong emitters such as our radar and jammers. This degree of accuracy allows him to use direction finding as the sole source of intelligence information for the delivery of suppressive fires against these emitters.

The Threat can determine with less accuracy the positions of relatively weak radio emitters using direction finding techniques. In this instance, the presence of our forces in a particular area is indicated or verified by direction finding, but the accuracy of location needed to deliver suppressive fires is lacking. When our operators are using correct communications procedures, the Threat will also have difficulty in determining the size and type of units associated with radio emitters. He will, therefore, probably use direction finding information from these sources in conjunction with intelligence information from other sources to refine locations for suppressive fires.

The Threat may elect not to use suppressive fires to quiet our electronic emitters. Instead, he may choose to monitor electronic emissions to gain further intelligence on our operations or to use deception and jamming to degrade the effectiveness of our electronic emitters and our operations.

Deception may be practiced by Threat operators who enter our radio nets by acting as legitimate stations and attempting to mislead or confuse our operators. Spoofers and other false targets will be used to deceive our radar operators. *Jamming* will be used by the Threat to prevent or reduce our use of electronic emitters by interjecting noise signals at the frequency of our emitters.



CHAPTER 3

THE THIRD DIMENSION - - - THE AIR THREAT

In all probability, our future foe will have more aircraft than our forces and his aircraft will be equal to ours in quality. The enemy will take full advantage of the inherent flexibility of his air forces. He has—and must be expected to use—the capability to attack our maneuver forces and their support elements.

This chapter describes the air threat to the ground forces. It focuses on that part of the threat that Chaparral and Vulcan will be pitted against—the low-level attack by fighters, bombers, and armed helicopters. It discusses the roles and capabilities of Threat aircraft, Threat air organization and concepts of air support, and techniques we can expect his aircraft to use when attacking our forces in the forward area.

CONTENTS	
	PAGE
The Threat Picture	3-1
Tactical Air Force Organization	3-6
Air Support of Maneuver Forces	3-8
Aircraft Attack Techniques	3-10

THE THREAT PICTURE

BACKGROUND — A General Lesson From the Middle East

Israeli Air Power, 1967. Referring to the Arab-Israeli "Six-Day War of 1967," Moshe Dayan declared that the key to the campaign was the Air Force. The record was truly impressive. The world press printed startling photos of vast columns of smoking tanks and trucks. Within 48 hours, through preemptive air strikes, the Israeli Air Force (IAF) had destroyed two-thirds of the Egyptian Air Force. By the end of those fateful 6 days, Israeli tanks were able to race across the Sinai to the east bank of the Suez

while fighting brief, fierce battles against demoralized Egyptians. Two fundamentally important lessons emerge from the Six-Day War. The first lesson is that without air defense to counter sophisticated air attack, the ground commander's maneuver can be seriously hampered. The second major lesson is that commanders at all echelons must be constantly aware of the tremendous destructive power of the modern fighter-bomber.

Arab Air Defense, 1973. The Arabs and their Soviet sponsors proved in October 1973 that the lessons of 1967 were well learned. The result was that Arab forces deployed the highest density and mix of sophisticated and effective air defense weapons ever used in combat. The total of Arab gun/missile systems was more than 10,000. The effectiveness of this massed AD weaponry was an unpleasant surprise to the IAF pilots who had successfully dodged SA-2s in 1967 by simply flying low. Among the air defense weapons waiting for the IAF at the lower altitude in 1973 were the SA-6, a tracked missile system; the SA-7 man-portable missile; and the ZSU-23-4, a tracked quad-23-mm system.

Air Power (Close Support), 1973. The Arab tanks were attacked by Israeli A-4

Skyhawks using 30-mm cannon, rockets, and standoff missiles such as the Hobo, Rockeye, and Maverick. The Israelis also resorted to low-level contour flying in pairs, avoiding air defenses and hitting enemy tank formations in the flank by surprise.

The Israelis were not the only users of modern aerial weaponry—they were also the target of Soviet fighter-bombers flown by Arabs. Although MiGs were reported in a ground attack role, the primary aircraft used by the Arabs in close air support were the SU-7, SU-20, and older MiG-17. Bombs and rockets were primarily employed to supplement the preferred attack method of cannon strafing. The 37-mm cannon of the MiG-17, for example, was reported effective against armored vehicles.

Conclusions: From the Middle East wars of 1967 and 1973, general conclusions concerning the low-altitude air threat to the maneuver force can be summarized as follows:

- An unrestricted, sophisticated Threat air force can seriously degrade our maneuver forces on the battlefield.
- Aerial-delivered weapons can destroy even the heaviest armored vehicles possessed by our maneuver forces.
- The types of Threat air-delivered weapons that can be delivered on our maneuver forces are unguided rockets, conventional bombs, cannon strafing, and air-to-surface missiles.
- Threat tactics, based upon observation of the Arabs and Israelis, would be to fly as low as possible with low angle release of ordnance and flank attacks.
- Based on the IAF experience, high-performance aircraft attacking ground targets are highly vulnerable to forward area air defense systems.

THREAT DEVELOPMENT

The lessons from the Middle East wars can offer clues relating to the present low-altitude Threat. The air attacks of the 1967

war demonstrated the effectiveness of bombing, rocket, and cannon weapon systems. Since 1967 there has been a

constant increase in the capability of the tactical air forces facing the United States and Allied armies. Aircraft navigation and onboard weapon systems have progressed to the point where low-level penetration and attack are quite feasible. Threat air capability has been enhanced by:

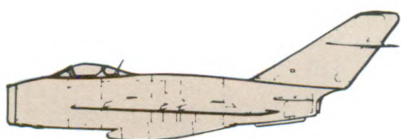
- Modernization of existing aircraft.
- Development of new aircraft.
- Introduction of new munitions.
- Production of armed helicopters.
- Improvement of aerial reconnaissance means.

Modernization of Existing Aircraft

Multipurpose Aircraft. The early MiG series of aircraft (MiGs-15, 17, 19, and 21) were all designed primarily as interceptors to perform an air-to-air combat mission. Early MiGs could only carry two bombs or rocket pods on wing pylons normally used to carry external fuel. Because of this limited ordnance carrying capability, their ability to attack ground targets was marginal. Although initial designs of these aircraft go back over a period of 20 years, MiGs 17, 19, and 21 are still being used in large numbers, and the latest models of the MiG-21 are still being produced. Improvements were made to the MiG-series aircraft to increase their ground mission capability.

All information in this manual on the air threat is unclassified and is, therefore, not precise. For detailed, precise planning, classified threat documents should be consulted.

The MiG-17, FRESCO C, is primarily employed for ground attack missions. Maximum speed is approximately Mach .9 with a combat radius of 175 nautical miles (with ordnance). It may be armed with cannons and either two bombs or two rocket pods.

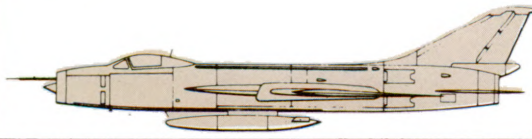


The MiG-21, FISHBED J, K, and L, all have four wing pylons instead of the two pylons on earlier models of the FISHBED series. This allows four bombs or four rocket pods to be carried instead of two. Improvements were also made to increase the range and radar search capabilities of these aircraft. The MiG-21 FISHBED J is a tactical fighter for combat in the battle area with a secondary role of providing air support for the ground forces. In addition to bombs and rockets, its armament can also include cannons and air-to-surface missiles.



Ground Attack Aircraft. The Threat's primary aircraft with a ground attack mission capability belongs to the FITTER series of aircraft. The first aircraft in the FITTER series is the SU-7B FITTER A. It was first deployed in 1959 and reflected earlier fighter design philosophy.

The Su-7B FITTER A is a single-seat ground attack fighter. Two external fuel tanks can be carried under the fuselage and there are wing attachments for stores. Two bombs or rocket pods can be carried under each wing. The Su-7B can also be armed with cannons and air-to-surface missiles.



The Su-7B FITTER A was modified to incorporate a variable geometry outer wing, and this new version was designated the Su-17 FITTER B. This variably geometry wing, along with other improvements in engine performance and avionics, was then incorporated into the third aircraft in the FITTER series, the FITTER C. These improvements increased the range and ordnance carrying capabilities over the older Su-7B FITTER A.

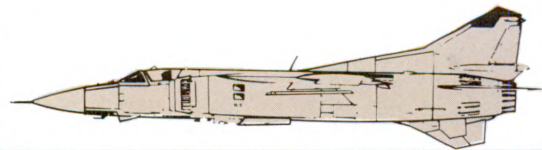
The Su-17/20 FITTER C is a single-seat, variable geometry ground attack fighter. The Su-17 strike aircraft is now operational in large numbers in Threat air forces. Six bombs or rocket pods can be carried. Armament also includes cannons and air-to-surface missiles.



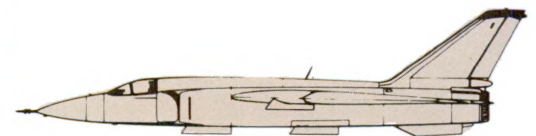
Development of New Aircraft

The Threat's changing design philosophy to place more emphasis on ground attack capability is not only reflected in improvement to his existing aircraft, but in new aircraft now entering the operational inventory. The newer aircraft, the MiG-23 FLOGGER and Su-19 FENCER, show a dramatic increase in ground attack capabilities.

The MiG-23 FLOGGER is a single-seat variable geometry fighter. It can attain speeds of approximately Mach 2.3 and has a combat radius of 600 miles. The MiG-23 can carry cannons, air-to-surface missiles, and either four bombs or rocket pods.



The Su-19 FENCER is a multirole combat aircraft classed as a fighter-bomber suited to interdiction and nuclear strike missions as well as interceptor and reconnaissance duties. It has two seats, side by side; two engines; variable geometry wings; and a single tail fin and rudder. It has a maximum speed at sea level of Mach 1.1 and a radius of action of approximately 500 miles. Armament may include cannons, air-to-surface missiles, and six bombs or rockets carried on external store stations.

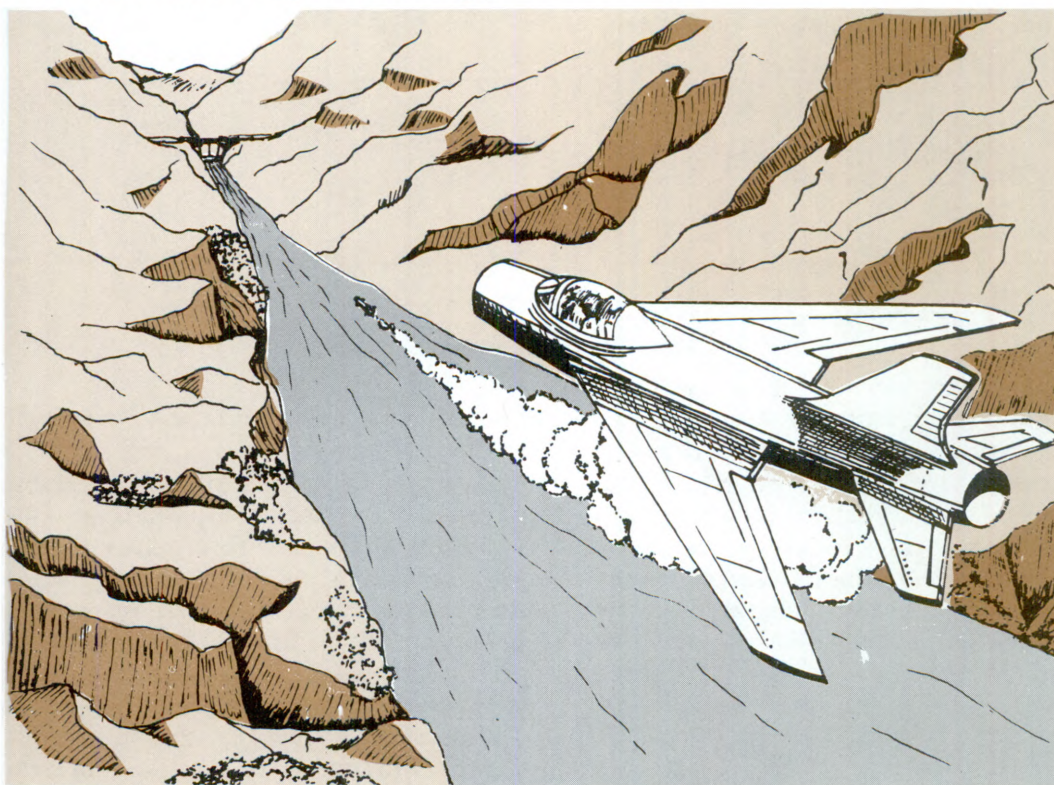


Introduction of New Munitions

First in importance has been the introduction of effective cluster bomb units (CBU) which can be carried in large numbers on virtually any aircraft, and dropped at high speeds and from low altitudes to cover a wide area. The individual power and overall density of the bomblet pattern are sufficient to knock out many armored targets and inflict high casualties.

Against point targets requiring a heavier and more concentrated explosive charge,

such as bridges on lines of communications, 1,000-lb HE bombs have previously been inadequate due to the inaccuracy of air delivery. Now, however, tactical air-to-surface missiles (TASMs) which are command, electro-optical, radar or laser guided, and delivered from either high or low level, can achieve accuracy within a few feet; and a single aircraft can destroy a bridge which only a few years ago would have defied attacks by large formations of aircraft.



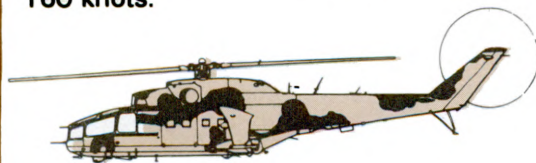
Modern Munitions Can Be Delivered With Pin-Point Accuracy.

Armed Helicopters

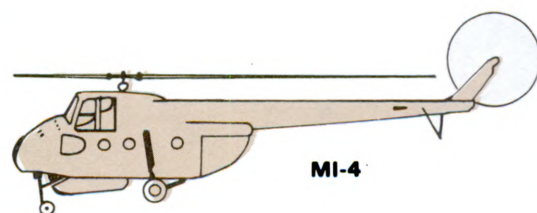
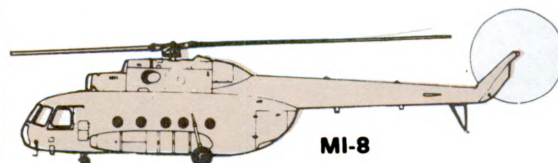
Attack helicopters (AH) can engage our tanks and other vehicles with long-range ATGM. The Threat has the most heavily armed helicopters in the world today. These helicopters also have the capability of remaining on station with significant

ordnance capability after discharging a squad in an assault role. Threat forces are expected to increase their helicopter force in the near future and should be expected to employ them near the FEBA as well as in the "overwatch" during assaults.

The MI-24 HIND presents the most serious threat to our maneuver forces. The HIND is the most heavily-armed helicopter in the world. HIND can carry four antitank-guided missiles mounted on the outboard wing stations and 128 rockets in 4 pods mounted on the inboard wing stations. Gun armament could range from a 12.7-mm machinegun to 23-mm cannon, mounted in the nose turret. The HIND has retractable landing gear and a cruise speed in excess of 140 knots, with maximum speed estimated in excess of 160 knots.



Two other helicopters, the MI-8 HIP and the MI-4 HOUND have been observed with mounted machineguns and rockets. These helicopters could be employed in the assault role.



Aerial Reconnaissance

Tactical air reconnaissance is an integral system of aerial data collection and the subsequent processing, interpreting, and distributing of desired intelligence concerning the enemy. It employs airborne collection devices ranging from aircrew eyes to the most advanced electromagnetic sensory devices. It provides all levels of command with timely and accurate information needed in making tactical decisions.

The Threat will use reconnaissance

aircraft equipped with photographic and electronic sensors which are capable of monitoring our operations in daylight, darkness, and inclement weather. Aircraft pilots employ visual reconnaissance, aerial photography, and electronic sensors. Reconnaissance aircraft can operate singly, but it is probable that they will operate with ground attack aircraft, the aim being to strike worthwhile targets of opportunity. Threat aircraft flying over their own side of the battle area may use side-looking airborne radar (SLAR).

TACTICAL AIR FORCE ORGANIZATION

GENERAL

Threat forces stress the role of tactical aviation in support of ground forces. Frontal aviation is the tactical air arm at the disposal

of the commander of a front and primarily provides support for the tactical operations of the ground forces in the frontal sector. A

front usually consists of two to seven armies, with six being optimum. An army may be made up of three to four divisions.

Besides the role of ground support, frontal aviation also carries out missions to establish air superiority over the combat zone and to conduct interdiction strikes and conventional and nuclear combat against enemy forces.

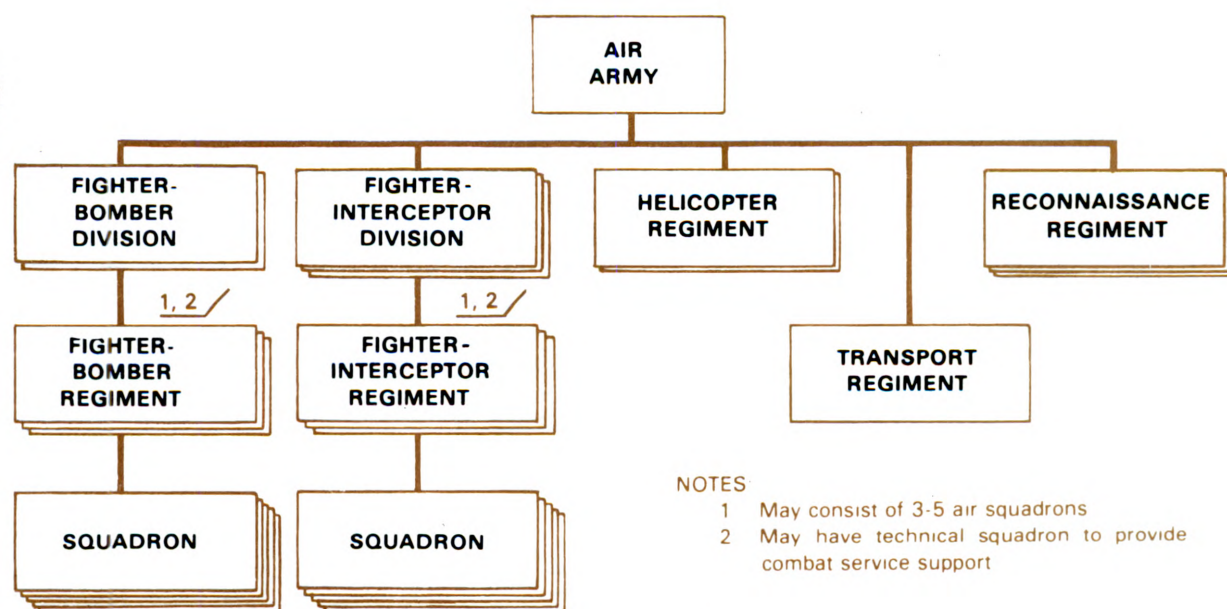
AIR ARMY

The largest tactical unit in the Threat air force is the air army. Air armies vary in organization, composition, and strength according to their missions. A frontal air

army generally consists of the following components:

- **Fighter-bomber divisions.**
- **Fighter-Interceptor divisions.**
- **Air reconnaissance regiments.**
- **Air transport regiments.**
- **Transport and general purpose helicopter regiments.**

The actual numbers and composition of each of these components vary greatly and, depending on the operational zone and the situation, the number of aircraft in an Air Army can range from 150 to 1,300.



NOTES

- 1 May consist of 3-5 air squadrons
- 2 May have technical squadron to provide combat service support

A Type Threat Air Army Organization.

AIR DIVISION

Air divisions are designated fighter-bomber or fighter-interceptor according to the type aircraft with which their subordinate regiments are equipped. A

typical air army could be composed of two fighter-bomber divisions and three interceptor divisions, each composed of three regiments.

AIR REGIMENTS

The air regiment is the basic tactical unit. It is composed of a single type of aircraft (e.g., fighter-bomber, interceptor, reconnaissance). A regiment normally consists of 40 operational aircraft and an additional 10-15 aircraft as a rotational reserve. However, the number of aircraft will vary depending on the type of regiment.

In a typical air army of two fighter-bomber and three interceptor divisions, the tactical aircraft in service with the nine interceptor regiments could have a dual-role capability and support the six fighter-bomber regiments in their air strike role. Each of these regiments has the capability of controlling three to five aircraft squadrons and a technical squadron, to provide organic maintenance, supply, and service support.

The air army may also include air transport, reconnaissance, and helicopter regiments. The latter are equipped with multirole MI-24 HIND and MI-8 HIP helicopters which may be used either in a transport role or for combat missions.

AIR SUPPORT OF MANEUVER FORCES

CONCEPT OF AIR SUPPORT

Threat forces consider air strikes as an extension of field artillery and place great emphasis on tactical air support of ground operations. They attack against preplanned targets such as tactical nuclear delivery systems, command posts, and communications elements, and to neutralize support and reserves within the tactical and immediate operational depths. Threat aviation forces usually do not use high-performance aircraft to provide close air support along the line of contact where field artillery can be employed. However, Threat aircraft are now being equipped with guided

munitions which presumably will increase their use in close air support along the line of contact. Additionally, armed helicopters will also operate in this area.

AIR SUPPORT OF OFFENSIVE OPERATIONS

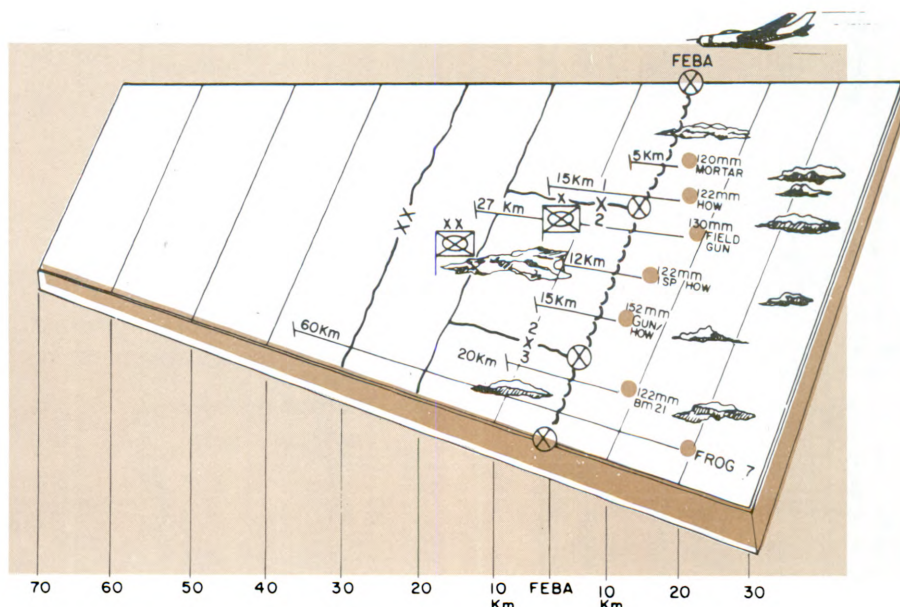
Actions Prior to the Attack

Preparation for an offensive operation may be divided into four phases:

- In buildup of aircraft and supplies, operations are cut to a minimum, but reconnaissance is continued and diversionary attacks are conducted on adjacent fronts. Fighter effort is devoted primarily to blocking enemy air attack.
- Bomber and attack sorties are used against the enemy to a depth of 400 miles or more. Reconnaissance is increased. Fighters operate against enemy air with greater intensity.
- Transition is made from operations against the enemy rear to attacks against targets in the immediate battle area. Attack aircraft and fighters step up the tempo of their operations.
- Attack and bomber operations are curtailed while fighters intensify their effort against enemy air to conceal the final preparations for the offensive and the concentration of ground forces.

Air Support of the Field Artillery Preparation

During the preparation fire, the air army attacks targets that are out of field artillery range or cannot be fired upon from the ground. The air attack, supplementing the field artillery fire, is of short duration. Specially detailed field artillery batteries neutralize enemy air defense guns during the air attack.



Air Attacks Supplement Field Artillery.

Air Support During the Attack

Once the attack is launched, bombers attack rear area installations. Attack aircraft execute strikes against targets whose suppression or neutralization is necessary. Interceptors supplement the bombers and attack aircraft and protect air

and ground units from hostile air attack. As the attack progresses into the depths of the enemy defensive system, small formations of planes remain constantly in the air to attack, either on their own initiative or on request from the ground forces, those targets that impede the progress of the motorized rifle and tank units.



Support of the Exploitation

During the exploitation and pursuit, all available air strength is used for attacks on the retreating forces and on advancing enemy reserves. The air effort adds impetus to the pursuit and helps prevent the defender from establishing new defensive positions.

SUPPORT OF DEFENSIVE OPERATIONS

In supporting the defense, air armies carry out the following specific missions:

- Reconnaissance to locate enemy dispositions and to obtain early warning of the direction and strength of attacks.
- Counterreconnaissance.
- Destruction of enemy nuclear or chemical delivery systems.
- Destruction of enemy air bases.
- Attacks on enemy concentrations to include delivery of nuclear or chemical fires.
- Air strikes in support of forces in contact.
- Attack of enemy penetrations.
- Support of counterattacks.

SUPPORT OF RETROGRADE OPERATIONS

The Threat air force actively supports retrograde operations by providing:

- Air cover (counterair).
- Reconnaissance of enemy activities, especially those threatening the flanks of the retreating forces.
- Delivery of air strikes against the enemy's main grouping and his flanking forces.

- Interdiction of enemy attempts to block the withdrawal by use of amphibious, airborne, or air landed forces.
- Destruction on the ground of any such forces that have succeeded in landing.
- Disruption of the enemy's lines of communication.

AIRCRAFT ATTACK TECHNIQUES

FIGHTER-BOMBER

The Low-Level Attack

To avoid medium- and high-altitude air defense systems, Threat aircraft operating in the ground attack role will probably approach the target area by flying as low as possible. Most attacks on ground targets near the FEBA will be at altitudes of less than 1,000 feet and at speeds of less than 500 knots.

Attacks will probably be made by flights of four aircraft which will separate into elements of two aircraft as they approach the target. The first element will attack, deliver ordnance, and execute an escape maneuver. The second element will follow almost immediately. If the flight has sufficient ordnance remaining, it will make a second attack on the target. However, the presence of ADA guns and short- and medium-range missiles will normally limit the attack to one pass, as the possibility of aircraft survival decreases as the time and opportunities available for ADA system engagement increase. The success of this one pass depends to a large degree on the element of surprise and this increases the probability that a low-level approach and exit profile will be used for the attack.

Attack Profiles and Ordnance Delivery

The most likely and frequent targets for Redeye will probably be aircraft using low-level popup and laydown delivery techniques.

POPUP

The popup consists of a run in at low level from an initial point (IP) about 10-20 km from the target, using natural terrain features to achieve surprise.

Aircraft flies from IP to a pull-up point about 3-5 km offset from target and then commences to climb to attack height (2,000-7,000 feet, depending on the weapon).

Aircraft wings over into dive attack on target. The attack heading will usually be between 45°-100° left or right of the original track from IP to PUP. Aircraft escapes at high speed and low altitude.

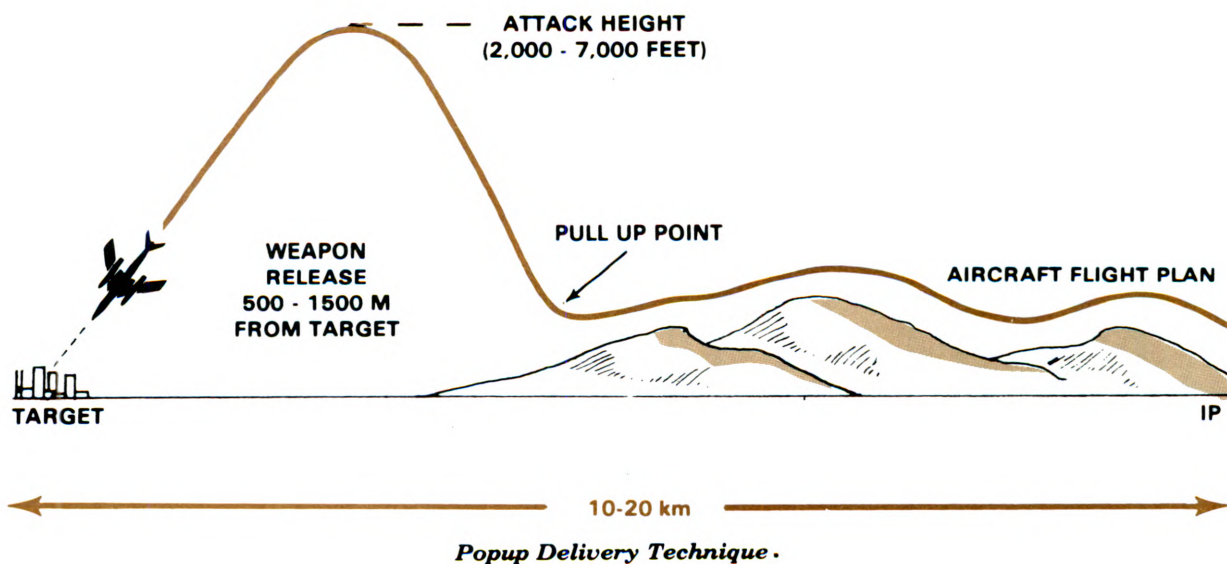
Weapons are released 500-1,500 meters from target.

ADVANTAGES

- Accuracy of weapon delivery.
- Target acquisition easier.

DISADVANTAGES

- Requires a high-cloud base.
- Vulnerable to ground fire on pull up.



Many varieties of popup delivery are possible.

TYPICAL POPUP ATTACK DELIVERY PROFILES			
WEAPON	BOMBS	ROCKETS	CANNONS
DIVE ANGLE (DEGREES)	30 20	30 10	30 10
ATTACK HEIGHT (FEET)	5,000 4,000	3,500 1,000	3,000 800
HEIGHT OF WEAPON RELEASE (FEET)	2,660 2,500	1,500 500	1,500 310
HORIZONTAL GRD RANGE FROM TGT AT WEAPON RELEASE (METERS)	1,110 1,460	800 900	800 530
SPEED OF AIRCRAFT (KNOTS)	450 450	400 450	300 500

LAYDOWN

The pilot flies the aircraft about 500 feet above the ground level at a speed of 350 to 900 knots.

Aircraft course is over the target area. High speed and low altitude increase the probability of success of the mission.

The ability to release ordnance at such low altitude is made possible by advances in the development of bomb retardation devices and aircraft avionics. The speed of ordnance fall is reduced by drogue chutes or retarding fins. This allows the aircraft to get out of the way before detonation occurs.

ADVANTAGES

- Maximum surprise.
- Minimum exposure to air defense fires.
- Attack can be made under low-cloud base.

DISADVANTAGES

- Less accurate weapon delivery.
- Target acquisition more difficult.
- Vulnerable to small arms fire.



Laydown Delivery Technique.

Types of Ordnance For Low-Level Attack

The type of ordnance delivered by low-level attack technique depends upon the nature of the target.

TYPICAL TARGETS FOR VARIOUS WEAPONS

		TARGETS	REMARKS
CANNON ROCKET NAPALM BOMBS CBU	CANNON	<ul style="list-style-type: none"> Troops, particularly in open. POL. Softskin vehicles. 	<ul style="list-style-type: none"> Solid armored piercing (SAP), HE warheads. Very accurate. Must hit to kill. Ineffective against armor, but could achieve mobility kill by damaging tracks.
		<ul style="list-style-type: none"> Armor. Light bridges. CPs. Softskin vehicles. 	<ul style="list-style-type: none"> SAP, AP (hollow charge or HE warheads). Pods, clusters. Very accurate. Must hit or near miss to kill.
		<ul style="list-style-type: none"> All except heavy structures. 	<ul style="list-style-type: none"> Delivered from 50-200' altitude. Attacking aircraft max surprise/min vulnerability. Less accurate delivery required. Hydrocarbon fuel + chemical gel for better adhesion to target.
	BOMBS	<ul style="list-style-type: none"> Armor (concentrations only). Area targets. Concrete. Field defenses. 	<ul style="list-style-type: none"> Large damage envelope results. HE warheads. Relatively poor accuracy in dive attack.
		<ul style="list-style-type: none"> Groups of armor. Other vehicles. Personnel, particularly in open. 	<ul style="list-style-type: none"> AP (hollow charge). Fragmented casing. Area weapon.

ATTACK HELICOPTER

Attack helicopters (AH) move to and from the battlefield at the lowest possible altitude, keeping cover between them and the enemy and often flying among trees and buildings. When firing they are only a few feet off the ground. AH, therefore, are difficult to acquire and, because they are "seen" as part of the ground clutter by medium- and high-altitude air defense systems, they are hard to lock-on and engage.

The attack helicopter, using nap-of-the-earth and sneak and peek techniques, will survey the battlefield for targets. Finding a tank, for example, the helicopter will use some sort of natural terrain, like a hill, to hide behind and, when the opportunity presents itself, will pop up over the hill and launch its ATGMs from maximum range. Because it has to visually guide the ATGM to the target, the helicopter is vulnerable to SHORAD-type weapons during this time.



II PART

HOW CHAPARRAL/VULCAN WILL COUNTER the THREAT

The success of the combined arms task forces in the forward areas is dependent on the success of every segment of the force from the tanker firing the first killing shot to the ammunition handler who replaces the expended round. No one part of the team is more important than another. Both success and failure will be equally shared.

Chaparral/Vulcan commanders are not responsible for killing the first Threat tank nor replacing the expended ammunition. Their responsibility is to insure that the rest of the elements in the force retain their capabilities to do their jobs in the face of Threat air attack.

The success of the Chaparral and Vulcan systems is dependent on the C/V commander deploying and employing his weapon crews to achieve maximum use and efficiency from each weapon in each tactical situation faced.

There are no "pat" solutions to the tactical problems that a Chaparral/Vulcan commander must solve. Each situation requires its own solution at the time and place it develops. To arrive at a correct solution, the Chaparral/Vulcan commander must know the capabilities of his weapons and crews; what he is trying to accomplish in their deployment; and how he is going to control their employment.

These next chapters provide the answers to what he must know. Collectively they are the tools that the Chaparral/Vulcan commander must use to solve each tactical problem.

If there is a recipe for a "pat" solution, it would be to take the principles and guidelines found in the next chapters, tailor with common sense and experience, and then apply.

II

CHAPTER 4

WEAPONS and ORGANIZATION

The Chaparral/Vulcan commander, whether he is commanding the battalion or a weapons squad within the battalion, must exploit the strengths of his unit while minimizing its weaknesses. To accomplish this, he must know these strengths and weaknesses—what his men and materiel can or cannot do.

This chapter provides an overview of the weapon systems and the basic organizational structure.

It contains fundamental information that the commander needs to know to successfully employ Chaparral and Vulcan and—

- The Redeye missile organic to all Chaparral platoons and in other units within the division.
- The forward area alerting radar/target alert data display display sets (FAAR/TADDS) found in each C/V battalion.

The chapter outlines the capabilities, as well as the limitations of each weapon system.

Shown are how the weapon systems are organized into squads, platoons, batteries, and finally, the Chaparral/Vulcan battalion to provide low-altitude air defense for selected division assets.

The chapter focuses on the equipment and organizational structure of the Chaparral/Vulcan battalion organic to armor, infantry, and mechanized infantry divisions. Other short-range air defense

CONTENTS

	PAGE		PAGE
Section I System Capabilities and Limitations		Section II How Chaparral/Vulcan Units Are Organized	
Chaparral	4-2	Squad	4-7
Self-Propelled Vulcan	4-3	Platoon	4-8
Towed Vulcan	4-4	Battery	4-8
Redeye	4-5	Battalion	4-9
Forward Area Alerting Radar/Target Alert Data Display Set	4-5		

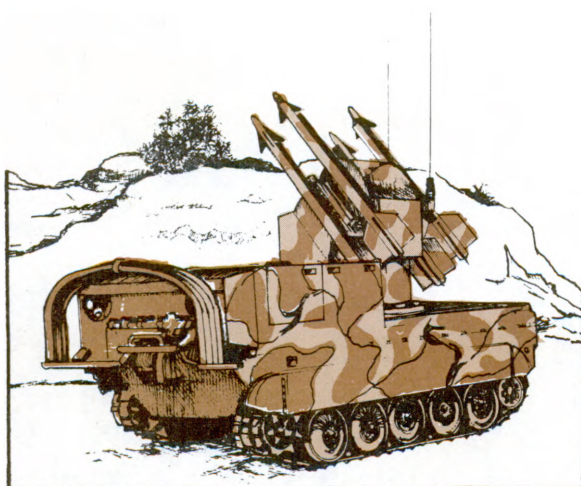
(SHORAD) battalions have similar capabilities. However, there are variations in equipment and organizational structure between the division C/V battalion and—

- **Nondivisional Chaparral/Vulcan battalions.**
- **Vulcan battalions organic to the airborne and air assault divisions.**

Appropriate TOEs should be consulted for detailed comparisons of organizations and equipment. Appendix K lists the field manuals and equipment manuals containing additional air defense system characteristics.

Section I. SYSTEM CAPABILITIES and LIMITATIONS

CHAPARRAL



CAPABILITIES

Chaparral is a self-propelled, short-range air defense guided missile system used to counter the low-altitude air threat. It is effective against both high-performance aircraft and slower moving fixed-wing aircraft and helicopters at ranges out to about 5 kilometers. Engagement ranges and effectiveness are dependent on such factors as the speed, size, aspect, and altitude of the target. (See FM 44-1A for classified details.)

The Chaparral weapon system consists of a launching station mounted on an M730 chassis (modified M548 cargo carrier). The launching station contains all equipment necessary for target engagement and can carry up to 12 infrared-seeking missiles.

Four “ready” missiles can be prepared for launching and are carried on launch rails. The remaining eight missiles are in storage compartments under the deck of the launching station. Reload time is about 8 minutes. The Chaparral gunner can position the launch rails 360° in azimuth and from -9° to 90° in elevation. The ready missiles can be fired at a rate of one per second. Chaparral has a “fire and forget” capability so once a missile is launched, the gunner can acquire and engage another target.

The launching station can be removed from its carrier and operated in a ground-employed mode or airlifted by either CH-47 or CH-54 helicopters. As a self-propelled system, the 12-ton Chaparral has a cruising range of about 480 kilometers at speeds up to 65 kmph. With a swim kit installed (20 to 30 minutes installation time), Chaparral can swim across water barriers; otherwise, it can ford streams with depths up to 1 meter.

It takes about 2 minutes for the Chaparral squad to prepare the system for operation from a march order configuration.

LIMITATIONS

The following must be considered when employing Chaparral:

- Chaparral cannot be fired while the carrier is moving.
- Little armor protection is provided for crew members and materiel.
- Missile backblast requires 15 meters of clearance behind the weapon (crew safety distance is 60 meters).
- Aerial targets must be visually acquired and identified prior to firing.
- The smoke signature generated upon missile launch may reveal the weapon's location.

SELF-PROPELLED VULCAN



CAPABILITIES

Self-propelled Vulcan is a mobile air defense gun system used to counter the low-altitude air threat. It is effective against both

high-performance aircraft and the slower fixed-wing aircraft and helicopters at ranges out to 1,200 meters. SP Vulcan can also provide effective ground fires against thin-skinned vehicles, personnel, and weapons to a range of about 2,000 meters.

The 12-ton SP Vulcan M163 gun system consists of a M168, 20-mm cannon mounted on a full-tracked M741 carrier (modified M113 APC). It is capable of speeds up to 65 kmph and has a cruising range of about 480 kilometers. SP Vulcan has a swim capability which allows it to cross water barriers at speeds up to 6 kmph.

The 6-barrel, 20-mm Gatling-type gun has a low-firing rate of 1,000 rounds per minute and a high-firing rate of 3,000 rounds per minute. Using a firing rate switch, the Vulcan gunner may fire at the high rate in bursts of 10, 30, 60, or 100 rounds. Vulcan normally uses air defense (high-explosive, incendiary, tracer, self-destruct (HEIT-SD)) ammunition, although HE ammunition without tracers or self-destruct feature is available for ground suppressive fires. Approximately 1,100 rounds of ready-to-fire ammunition are available in a storage drum. Storage facilities exist for an additional 800 to 1,000 rounds within the carrier. Reload time is about 5 minutes.

An onboard range-only radar (ROR) provides ranging information for the fire control system. The cannon can be traversed 360° in azimuth and elevated between -5° and 80°. Although equipped with a night sight for ground fire support, Vulcan is a fair-weather air defense weapon.

SP Vulcan can be fired while moving, but fire delivered when the weapon is emplaced (less than 10 seconds after the vehicle is stopped) is much more accurate.

LIMITATIONS

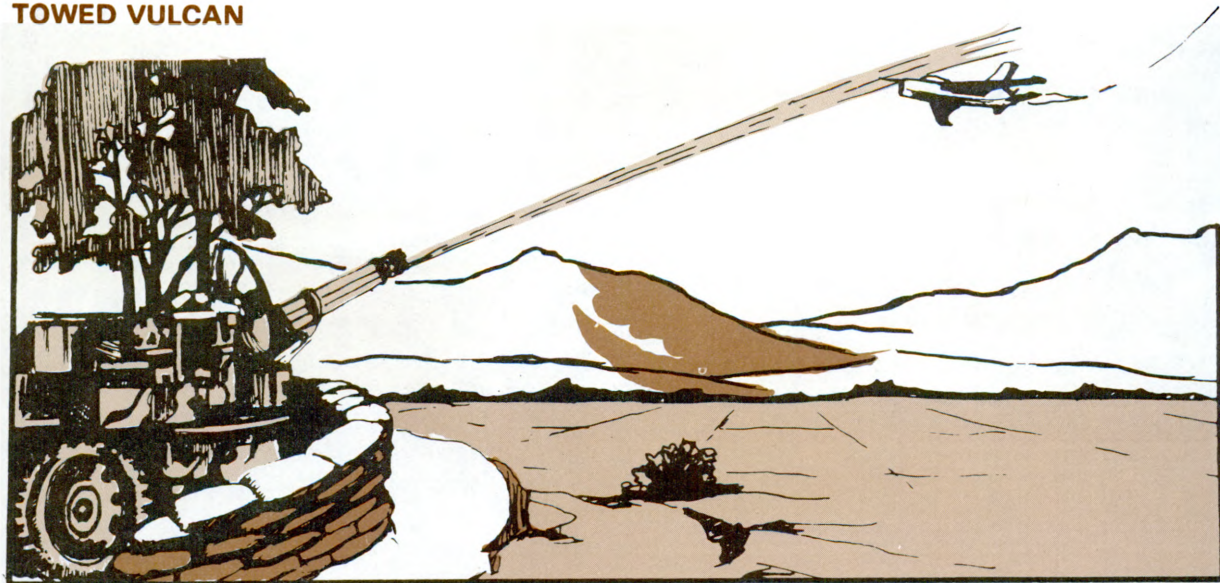
The following must be considered when employing SP Vulcan:

- Little armor protection is provided for crew members and materiel.
- The high firing rates and limited onboard storage capability make ammunition conservation a must.

- Aerial targets must be visually acquired and identified prior to firing.

- Hit probability against high-speed aircraft is reduced when they fly a crossing course.

TOWED VULCAN



CAPABILITIES

The towed version of Vulcan is used in nondivisional C/V battalions and the Vulcan battalions organic to airborne and air assault divisions to counter the low-altitude air threat. It can also be used to engage ground targets. Since the towed Vulcan system uses the same 20-mm cannon, ROR, and ammunition as SP Vulcan, weapon characteristics are similar except that only 500 rounds of ready-to-fire ammunition are available on the weapon. However, reload time is less than 3 minutes.

The towed Vulcan gun system consists of an M168 cannon mounted on an M42 gun carriage. The prime mover is usually an M561 Gama Goat, although other vehicles such as a 2½-ton truck may be used. The

comparatively light weight of towed Vulcan (3,150 lb) permits its use in support of airborne or air assault operations as it can be transported either by helicopter or cargo aircraft. It is also airdroppable.

While it is possible to fire towed Vulcan while moving, it is much more effective when emplaced. Emplacement time is about 2 minutes.

LIMITATIONS

The following must be considered when employing towed Vulcan:

- No armor protection is provided for crew members and materiel.

- Towed Vulcan is dependent on its prime mover for mobility.
- The high firing rates and limited onboard storage capability make ammunition conservation a must.
- Aerial targets must be visually acquired and identified prior to firing.
- Hit probability against high-speed aircraft is reduced when they fly a crossing course.

REDEYE



CAPABILITIES

Redeye is a man-portable, shoulder-fired, air defense, infrared-seeking, guided missile system which provides combat units with the capability of destroying low-altitude hostile

aircraft. It has an effective range of about 3 kilometers. Engagement ranges and effectiveness are dependent on such factors as the speed, size, aspect, and altitude of the target. (See FM 44-1A for classified details.)

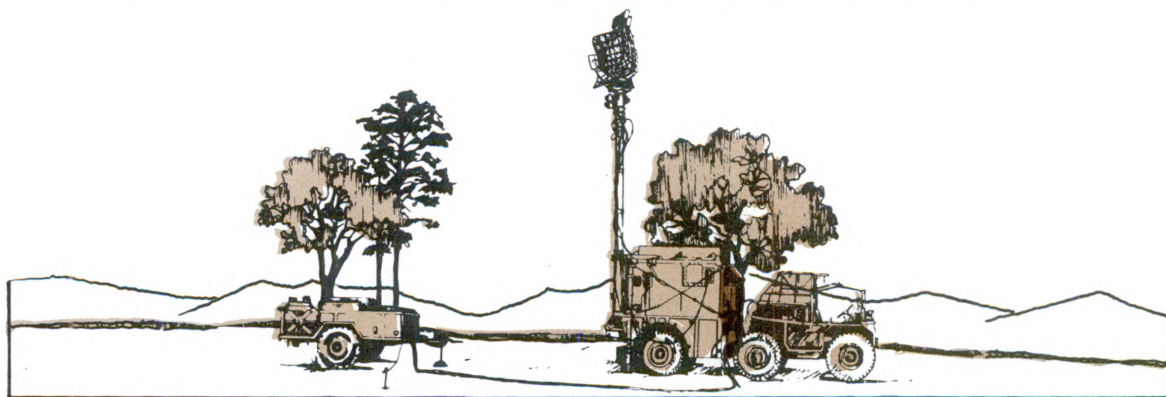
Because it is man-portable, Redeye can be deployed easily throughout the forward area. It moves with the troops, providing continuous and responsive air defense. Redeye is a simple weapon to maintain, requiring only go/no-go checks by the gunner. As Redeye teams can move after firing and can easily hide, Redeye suppression by the enemy is difficult. The basic load of Redeye missiles per Chaparral platoon is six.

LIMITATIONS

The following must be considered when employing Redeye:

- Redeye is primarily a tail-chase weapon; intercepts normally occur after the aircraft passes the weapon position.
- Targets must be visually acquired and identified prior to firing.
- The smoke signature generated upon missile launch may reveal the weapon's location.
- Mobility and team protection are dependent on the carrier, whether it is man, truck, or armored personnel carrier.

FORWARD AREA ALERTING RADAR/TARGET ALERT DATA DISPLAY SET

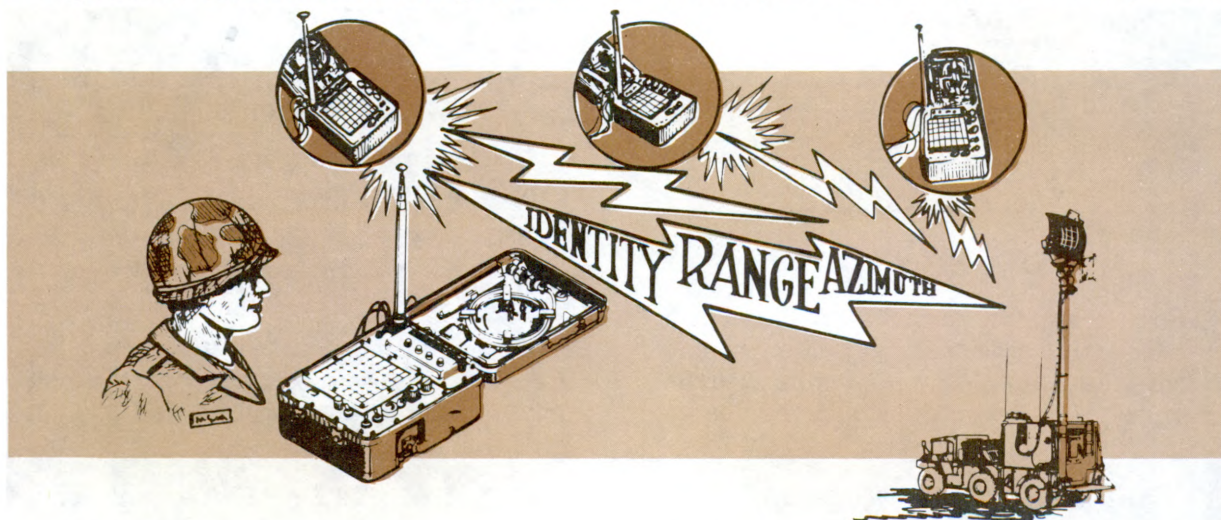


The forward area alerting radar (FAAR)/target alert data display set (TADDS) system is the primary means of providing alert warning information to Chaparral and Vulcan squads and Redeye teams. In addition to providing alert warning information, FAAR/TADDS provides SHORAD weapons with tentative identification (final identification for SHORAD weapons is always visual) and approximate range and azimuth of approaching aircraft.

FAAR

The FAAR system (radar system AN/MPQ-49) is a complete self-contained acquisition radar system consisting of radar set AN/TPQ-32, the M561 Gama Goat and a 5-kw generator set mounted in a cargo trailer.

FAAR is relatively lightweight (6 tons), mobile, and capable of being deployed as required to support Chaparral, Vulcan, and Redeye. The system is air transportable and can be lifted and moved by CH-47 or larger helicopters. The FAAR system aids in denying enemy aircraft undetected access to forward combat areas. The FAAR provides relative position data for each aircraft detected, in terms of distance (range) and direction (azimuth). Through use of the AN/TPX MARK XII identification, friend or foe (IFF), system, FAAR also provides tentative target identification. These data can be transmitted by radio-frequency data link (RFDL) to TADDS receivers located with Chaparral and Vulcan squads and Redeye sections and teams. The target information displayed on the TADDS can be inserted, updated, and removed by the FAAR operator.



While FAAR is highly susceptible to damage from small arms and field artillery fire, the system can be operated from a protected spot up to 76 meters (250 ft) from the radar system and antenna by removing and remoting the control-indicator assembly. FAAR can detect targets at ranges out to 20 kilometers.

TADDS

The battery-operated TADDS is a lightweight receiver used by weapon crews to

receive target alert information transmitted from a FAAR. It receives and displays on a matrix, location and tentative identification of aerial targets detected by its associated FAAR.

As each FAAR uses a different radio frequency for transmission of its data, the TADDS is linked with only one FAAR at a time. The TADDS must have line of sight with its associated FAAR to receive the FM data link and be positioned 15 kilometers or less from the radar so that the weapon

position can be plotted on the TADDS matrix. The crewman normally selects the FAAR deployed in his vicinity that can provide the best alert warning information for his location and mission. When weapons and FAARs are redeployed during the course

of an operation, the crewman may select another radar for his alert warning information. Additional information concerning FAAR/TADDS operations is discussed in FM 44-6.

Section II. HOW CHAPARRAL/VULCAN UNITS ARE ORGANIZED

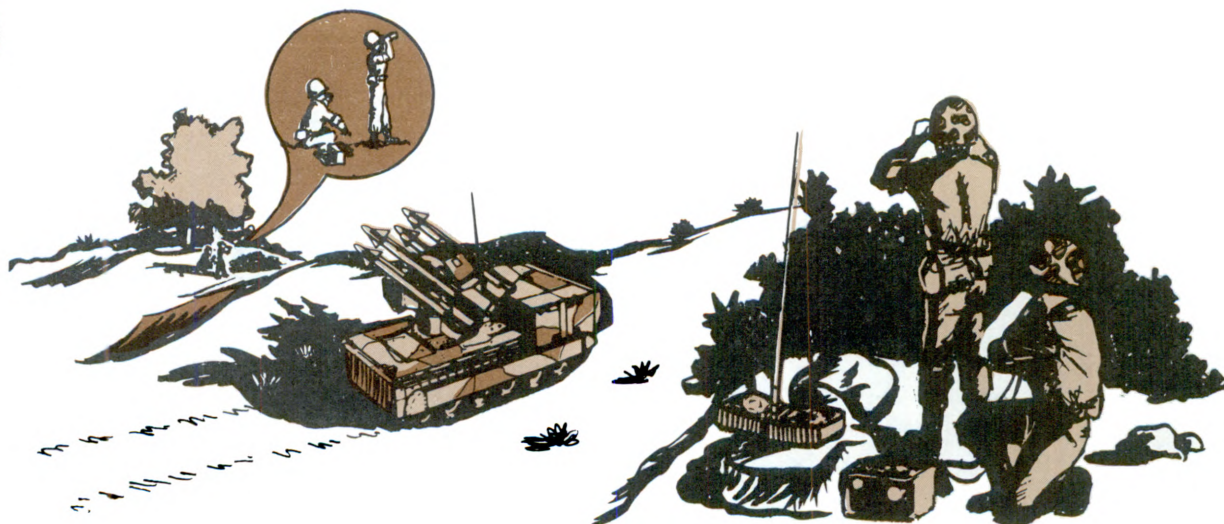
SQUAD

The smallest tactical organization within the C/V battalion is the weapons squad.

CHAPARRAL

The Chaparral squad consists of five personnel (squad leader, senior gunner, two gunners, driver). When the squad is deployed, a squad command post and a forward

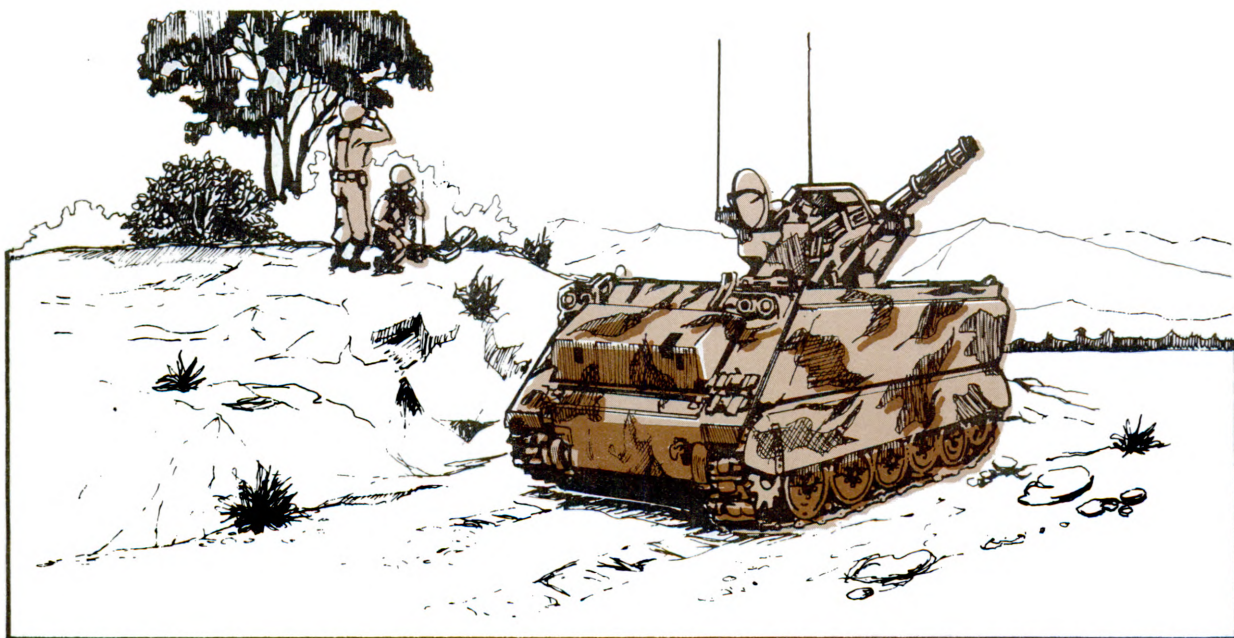
observation post are established. Only one crew member remains with the weapon to engage targets and launch missiles. The squad leader exercises command and control at the squad CP; however, personnel at both posts act as visual observers. Squad communications are maintained through use of field telephones connected to the Chaparral intercommunications system.



VULCAN

The SP and towed Vulcan squads each consist of four personnel (squad leader, senior gunner, gunner, driver). When SP Vulcan is defending a static asset, the squad leader normally establishes a CP/OP a short distance away from the weapon. When

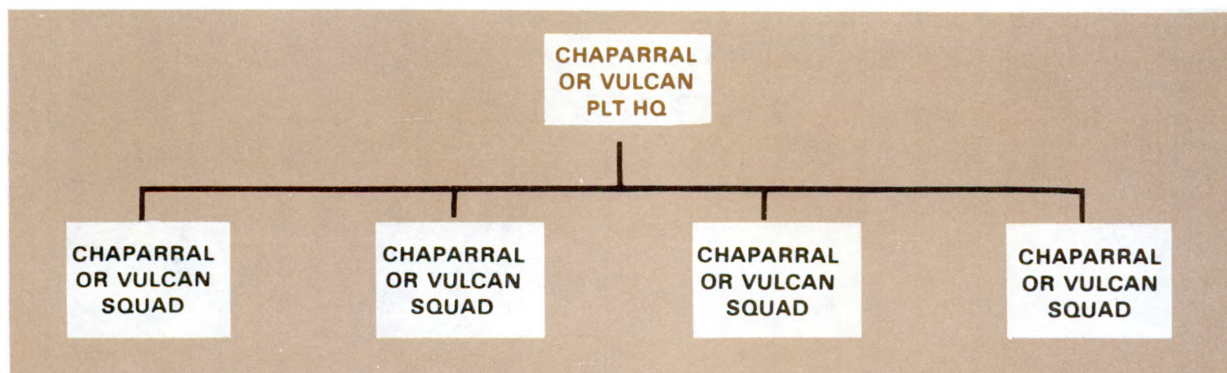
supporting a mobile force, the squad leader will exercise command from a position immediately adjacent to, or within, the Vulcan carrier. The towed Vulcan squad is similarly organized.



PLATOON

Four weapon squads are grouped to form either a Chaparral or Vulcan platoon. The platoon headquarters section provides command and control for the weapon squads and contains the platoon ammunition truck.

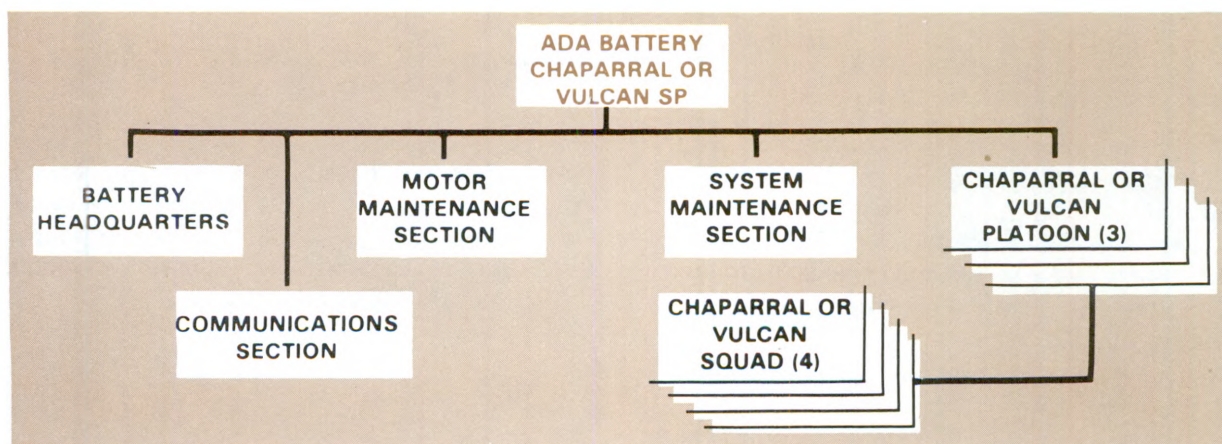
In addition to its primary weapons, each Chaparral platoon also has six Redeye missiles to augment its self-defense capability against suppression attempts by enemy aircraft.



BATTERY

Chaparral and Vulcan batteries are similarly organized. Each battery has three weapon platoons, each containing four weapon squads. The battery provides

organizational maintenance support for weapons, vehicles, and communications equipment and other logistical support for weapon crews.

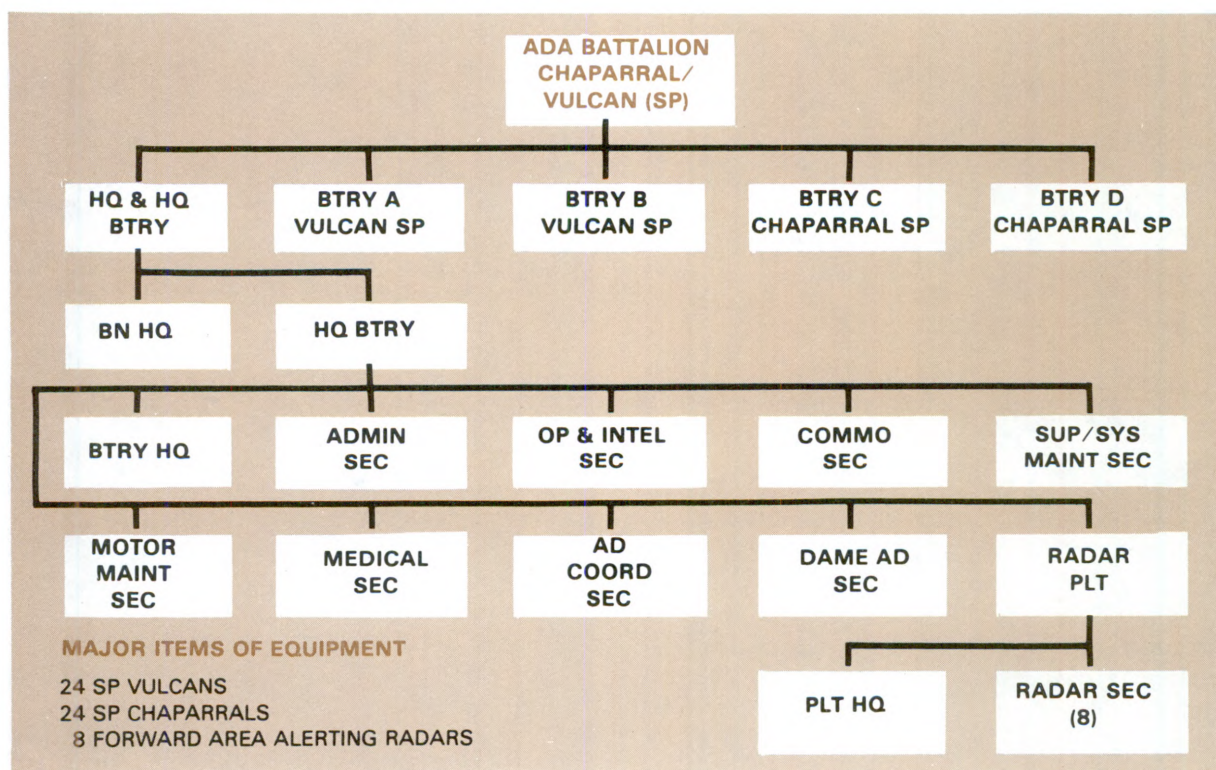


BATTALION

DIVISIONAL CHAPARRAL/VULCAN

The divisional Chaparral/Vulcan battalion is organic to armor, infantry, and mechanized divisions. The battalion is part of the division base and normally remains under direct control of the division commander. The battalion consists of a headquarters and headquarters battery, two

self-propelled Vulcan batteries, and two self-propelled Chaparral batteries as indicated below. The headquarters battery provides personnel to exercise command and control of the battalion and support the weapon batteries administratively and logistically.



**NONDIVISIONAL
CHAPARRAL/VULCAN**

The nondivisional battalion differs from the divisional battalion in that Vulcan batteries are equipped with towed Vulcans rather than SP Vulcans. The nondivisional battalion does not have a division airspace management element (DAME) air defense section.

**AIRBORNE/AIR ASSAULT DIVISION
VULCAN**

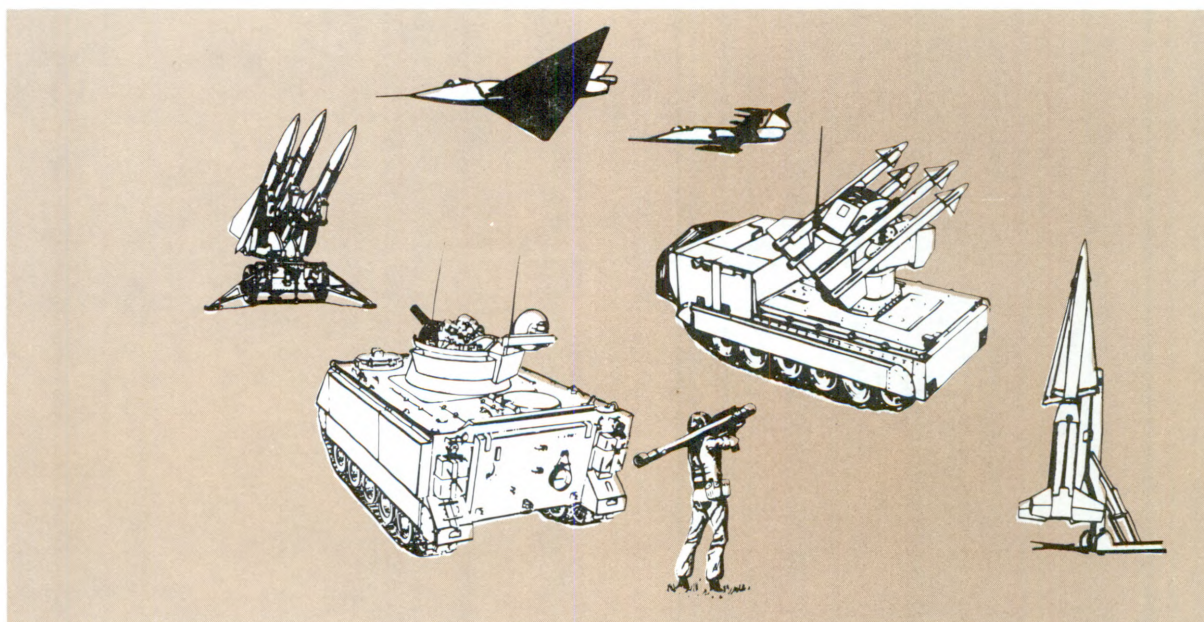
Airborne and air assault division ADA battalions are organized with four towed Vulcan batteries. There is no medical section in the air assault division ADA battalion although an aidman is included in each battery organization.



CHAPTER 5

COMMAND and CONTROL

One of the fundamental principles of air defense is that all weapons must be *integrated* into the force commander's scheme of maneuver and into the battle for air superiority. The air battle will be fought with small arms, guns, missiles, and aircraft employed in the air defense role. The air attack (when it comes) will be sudden, by large numbers of aircraft on widespread multiple targets. The defense will include the air defense assets of all US Services and our Allies. Effective management of these assets is the key to winning the air battle.



CONTENTS

	PAGE
Theater and Corps Air Defense	5-2
Divisional Battalions	5-4
Nondivisional Battalions	5-6
Rules of Engagement	5-7
Fire Distribution	5-11
Air Defense Warnings and States of Alert	5-11
The Engagement Decision	5-12

This chapter tells how Chaparral and Vulcan units are integrated into the overall air defense structure in a theater of operations while providing dedicated air defense for specified critical assets of the ground force commander. The chapter includes:

- A description of the command, control, and coordination links the Chaparral/Vulcan battalion commander establishes with higher air defense authority, with division command posts, and with

subordinate and supported units.

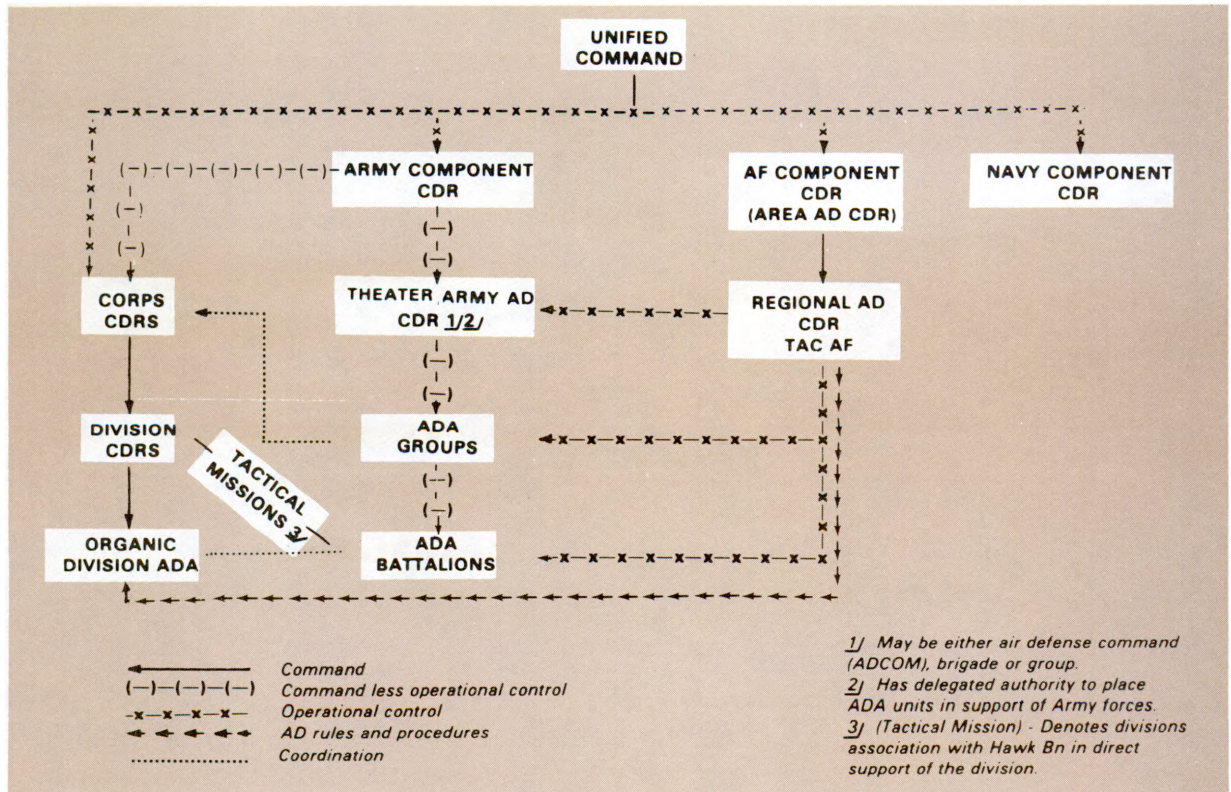
- A discussion of the means and methods of controlling and distributing the fires

and establishing the readiness posture of Chaparral and Vulcan units.

THEATER AND CORPS AIR DEFENSE

Air defense in a theater of operations is an all-service responsibility. **All air defense assets within the theater are integrated.** To make this integration work, air defense forces must follow AD rules and procedures which provide for centralized

management of the total air battle. Air defense forces management must be flexible to respond to the needs of the force it supports. An illustrative organization for theater air battle management is shown below.



With management flexibility in mind, the area air defense commander, normally the Air Force component commander, divides the theater into regions for air defense purposes. The region air defense commander (normally a USAF officer) is responsible for, and has full authority in, the air defense of his region. He normally delegates authority for employment of organic

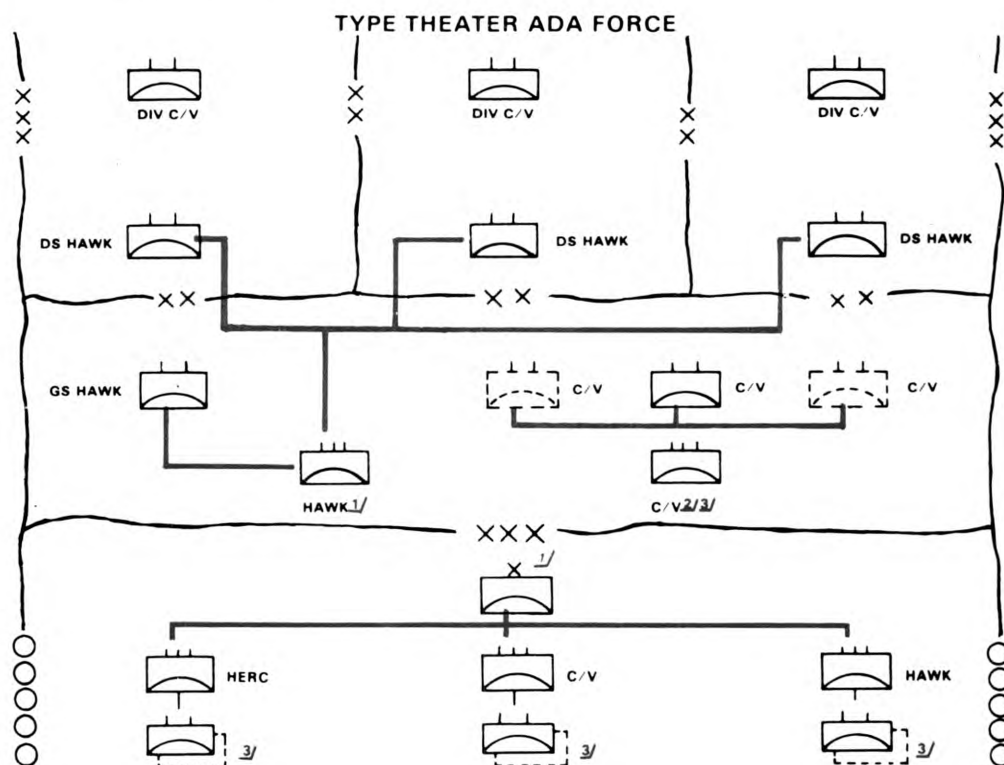
Army air defense means to the commanders of the major Army elements (e.g., divisions) within his region. He will normally delegate to the commanders of the major Army subdivisions of his region the authority to move Army air defense units in direct support of Army forces as depicted in the theater air defense organization charts.

The region commander issues rules and procedures which all air defense units must follow. These rules and procedures give the ADA unit commander the criteria he will use to determine if an aircraft is hostile and establish the degree of control placed on the firing of his weapons. This is normally the only theater-level control exercised over the firing of short-range ADA weapons. Long- and medium-range ADA weapons operate with an electronic command and control system that is tied into a regional control system, enabling the exchange of aircraft track information on, and direct assignment of, hostile aircraft for engagement by these weapons.

Coordination of ADA and air operations is conducted at all levels.

ADA operations in each defense are coordinated with the responsible USAF or USN air defense/air traffic control facilities. Facilities for coordination of operations are designated by the region air defense commander, but they frequently involve the formation of joint facilities for region-level control and coordination.

The theater air defense plan assigns defense priorities to the major ADA headquarters in the theater. **Theater Army ADA units (groups and their battalions) with corps support requirements may be under the operational control of the region AD commander.** If so, he normally delegates the authority to the theater Army ADA commander to place these ADA units in support of the corps.



NOTES

1 May be an Army air defense command, brigade or group dependent on the size of the theater of operations and number of ADA battalions assigned

2 May be a group or a battalion. Nondivisional C/V to defend critical assets, to reinforce divisional C/V, or for support of the corps Armored Cavalry Regiment/ Separate Infantry Brigade.

3 Number of battalions dependent on size of theater of operations.

DIVISIONAL BATTALIONS

The C/V battalion organic to the division is usually retained under the direct control of the division commander. ***The C/V battalion commander exercises command over all ADA units organic, assigned, or attached to the division; and assumes operational control of any ADA forces that may be placed under the operational control of the division. He is also the division air defense officer and, in this capacity, he—***

Serves as the principal adviser to the division commander on all air defense matters.

Coordinates air defense activities with other staff elements.

Prepares air defense plans.

Serves as the point of contact for all ADA forces supporting the division.

Coordinates with the DS Hawk battalion commander and with the division commander and staff in determining the deployment of Hawk units within the division area.

Establishes a communications link with higher air defense authority (usually through the DS Hawk battalion) for receipt of orders and information pertaining to air defense.

Disseminates air defense orders and information to all SHORAD elements in the division, to include the Redeye sections with maneuver and field artillery units.

Provides technical advice for employment of the division Redeye sections and special staff supervision of their training programs.

The C/V battalion commander locates his command post where he can best control his units and coordinate with other command posts (i.e., division main and tactical and DS Hawk battalion CPs). A ***tactical operations center (TOC), established at the C/V battalion CP,*** serves as the focal point for the control of all air defense operations within the division. It is manned by the operations and intelligence and communications sections of the battalion headquarters. ***Functions performed at the TOC include:***

- Planning, supervising, and directing air defense operations.
- Receiving and disseminating air defense fire control orders and information.
- Collecting, processing, and evaluating information and disseminating intelligence on both the ground and air battles.
- Receiving and disseminating NBC information.
- Determining and maintaining the current operational status of subordinate units.
- Performing or assisting in the performance of routine functions such as preparation of operations orders, journals, situation maps, records, and reports.

REFERENCE

For more detailed information on the organization and functions of the tactical operations center, see appendix I.

Personnel from the C/V battalion join with Army aviation personnel to form the division airspace management element (DAME), which is an integral part of the division main command post. An ADA element is also positioned with and forms a part of the division tactical command post.

The DAME and the ADA element at the division tactical CP serve as the focal points for coordination of air

defense operations with other division staff elements, as well as performing airspace management functions. The DAME plans and coordinates the immediate use of airspace behind brigade rear boundaries and the future use of airspace over the division as a whole. The element at the tactical CP coordinates the immediate use of airspace and ADA operations in the brigade areas. Close coordination between the battalion TOC, the DAME, and the ADA element at the tactical CP is essential.

REFERENCES

Doctrine, concepts, and procedures for airspace management are contained in—

■ FM 44-1, US Army Air Defense Artillery Employment, Chapter 10, Combat Zone Airspace Management.

■ FM 1-60, Airspace Management and Army Air Traffic in a Combat Zone.

■ FM 100-28, Doctrine and Procedures for Airspace Control in the Combat Zone.

■ FM 100-42, US Air Force/US Army Airspace Management in an Area of Operations.

■ TC 101-5, Control and Coordination of Division Operations.

The C/V battalion's air defense coordination officer and his section are normally located in the operations

center of the direct support Hawk battalion.

THE C/V BN AIR DEFENSE COORDINATION OFFICER INFORMS

C/V BATTALION

ON

Air defense rules and procedures received through the Hawk battalion from higher air defense authority having application to divisional air defense.

Hostile and friendly tracks from the Hawk battalion.

Plans, activities, and status of the Hawk battalion and other ADA units in the corps.

HAWK BATTALION

ON

Location and status of divisional air defense units.

Enemy air activity and threat data received by the C/V battalion from divisional units.

Friendly divisional aircraft activities received from the division airspace management element (DAME).

The **DS** mission requires the **Hawk battalion** to establish liaison and communications with the supported unit. Accordingly, it **sends a liaison officer to the division main command post** who works closely with C/V and aviation personnel in the DAME.

In the absence of a DS Hawk battalion, such as might be the case when the division is in reserve, the air defense coordination officer—

May be located with the nearest ADA command post having a direct communications link with an Air Force control and reporting center or post (CRC/CRP)—

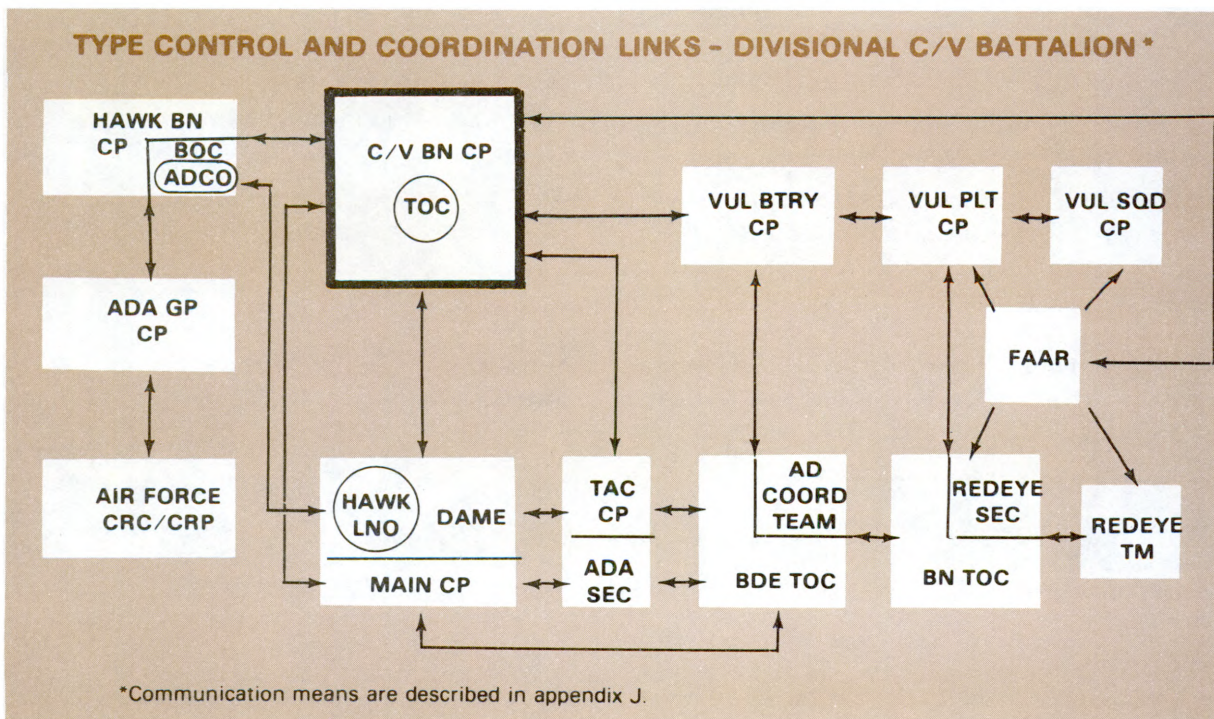
OR

Be collocated with a CRC or CPR.

Each divisional ADA TOE will provide **an air defense coordination team** for each of the three brigades. The officer in charge of the team **advises the brigade commander on air defense matters and coordinates air defense** within the brigade.

Chaparral and Vulcan batteries and platoons coordinate closely with defended units/assets. Platoons and squads tie in with FAARs for alert warning.

Typical command, control, and coordination links for the divisional battalion are shown below.



NONDIVISIONAL BATTALIONS

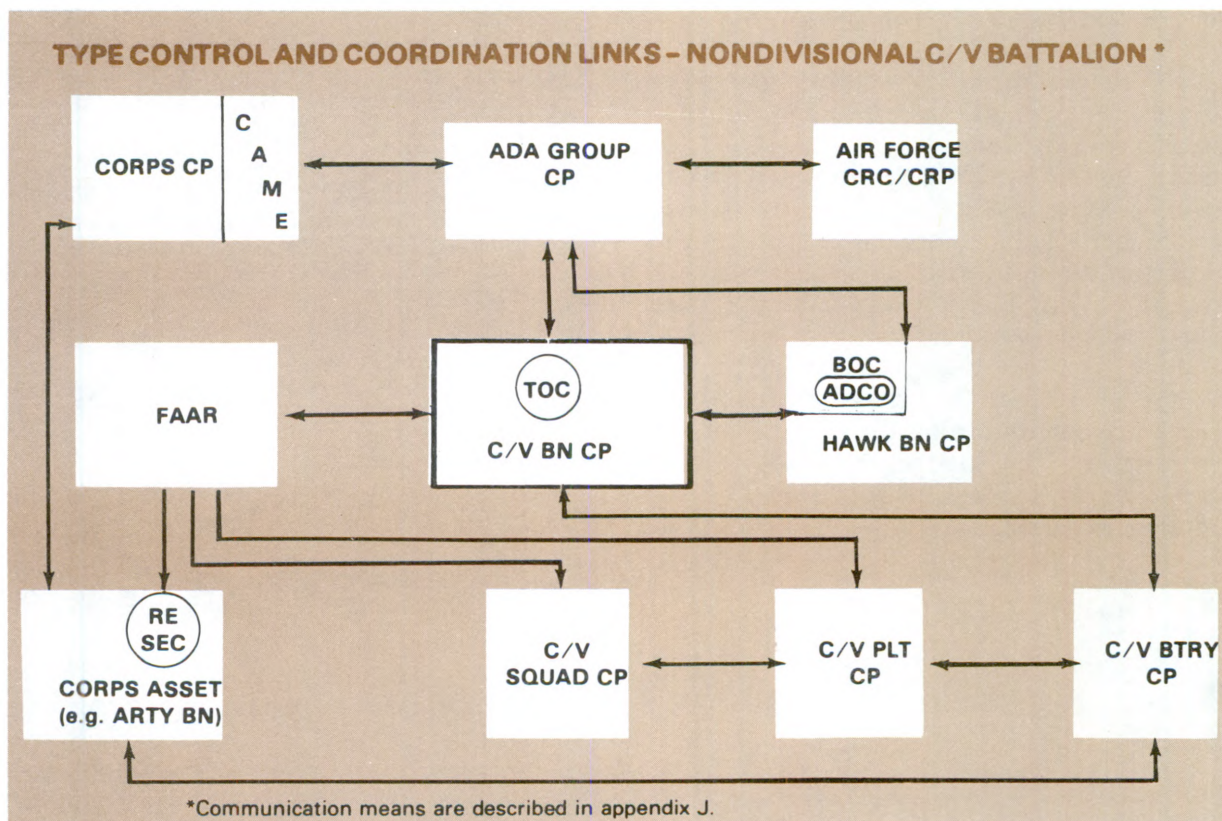
Nondivisional Chaparral/Vulcan battalions are part of the theater army air defense organization and **are allocated by the theater army air defense commander as required to provide**

short-range air defense of theater and corps assets. When allocated to a corps, nondivisional C/V battalions are assigned/attached to the ADA organization supporting the corps, usually an ADA group.

The nondivisional battalion commander exercises command and control over his organic or attached ADA units. He establishes liaison and communications with supported units or defended assets as directed by the commander assigning him his air defense

mission. A tactical operations center is established as a part of the battalion command post. It is organized similarly to and performs essentially the same functions as the divisional battalion TOC (appendix I).

Typical command, control, and coordination links are as shown below.



RULES OF ENGAGEMENT

GENERAL

Control of the fires of Chaparral and Vulcan weapons differs from that of the longer range, more sophisticated Hawk and Nike Hercules systems in that the elapsed time from target detection and identification until target flyover is measured in seconds rather than minutes. In addition, Chaparral and Vulcan weapons are manned and fired by squads rather than by batteries or platoons; each squad is individually positioned and is separated from all other squads in the same defense. To be effective,

the firing decision must be accomplished at the weapon, and authority to engage must be delegated to the weapon commander (C/V squad leader), subject to prescribed rules of engagement. Therefore, to control fires of their weapons, Chaparral and Vulcan commanders must insure that each squad leader has all the information and instructions necessary to make the correct engagement decision at the correct time.

Air defense rules of engagement delineate the circumstances under which weapons can fire at an aircraft. They include:

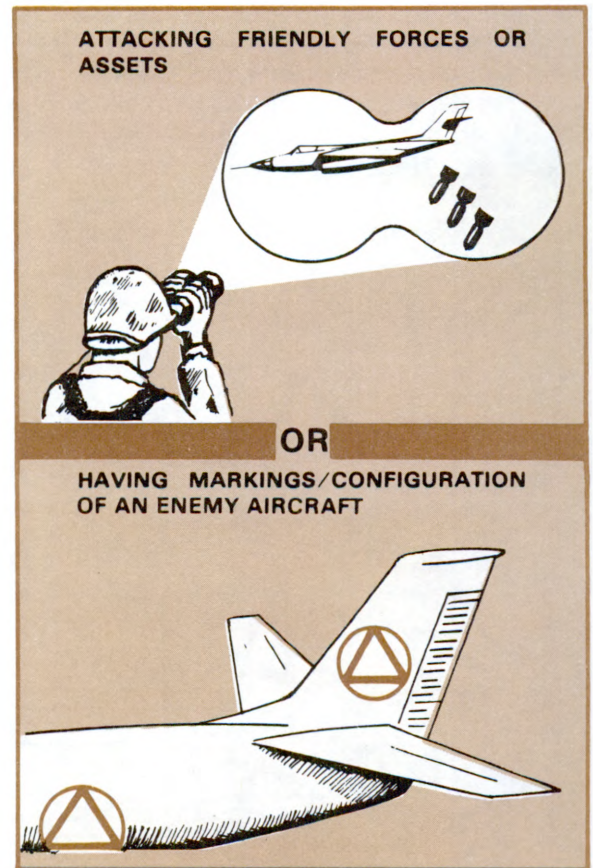
- **HOSTILE CRITERIA.**
- **WEAPONS CONTROL STATUS.**

The rules and procedures prescribed by the region air defense commander provide the basis for the rules of engagement used by Chaparral and Vulcan squads. Rules of engagement are included in the tactical SOPs and operations plans and orders of all units with air defense weapons (e.g., battalion, brigade, and division). They are used to establish varying degrees of control over air defense fires to provide protection of friendly aircraft while, at the same time, maintaining the level of defense required by the tactical situation. When received by the squad leader, the rules of engagement tell him—

- **WHAT HE CAN SHOOT.**
- **WHEN HE CAN SHOOT.**
- **WHERE HE CAN SHOOT.**

HOSTILE CRITERIA

Hostile criteria provide means through which an aircraft may be identified as enemy. Since Chaparral and Vulcan weapons rely on visual inspection of an aircraft for identification, hostile criteria are based strictly on the features and actions of the aircraft as seen by the squad leader. *They include, but are not necessarily limited to:*



WEAPONS CONTROL STATUS

The weapons control status establishes the degree of control over the fires of Chaparral and Vulcan weapons:

WEAPONS FREE—Fire at any aircraft not positively identified as friendly. This is the least restrictive status.

WEAPONS TIGHT—Fire only at aircraft positively identified as hostile according to the prevailing hostile criteria.

WEAPONS HOLD—Do not fire except in self-defense. This is the most restrictive status.

RIGHT OF SELF-DEFENSE

Rules of engagement do not prohibit a unit or air defense weapon from shooting at an aircraft that is attacking it—**THE RIGHT OF SELF-DEFENSE IS NEVER DENIED.**

APPLYING THE RULES OF ENGAGEMENT

The following chart illustrates how the Chaparral or Vulcan squad leader uses the rules to decide whether or not to engage an aircraft:

SQUAD LEADER'S ENGAGEMENT DECISION			
WHAT IS THE WEAPONS CONTROL STATUS?	WHAT CAN I SHOOT?	HOW CAN I TELL?	WHAT DO I DO?
WEAPONS FREE	Unknowns Hostiles	I don't recognize him as a friendly aircraft	ENGAGE!
WEAPONS TIGHT	Hostiles only	He's committing a hostile act I recognize him as a hostile aircraft	ENGAGE!
WEAPONS HOLD	NO ONE *		CONTINUE TO OBSERVE!
	*Unless he is attacking me	He's shooting at me	DEFEND MYSELF! Shoot back!

VARYING THE WEAPONS CONTROL STATUS

The weapons control status is changed by the region air defense commander as the progress of the air battle dictates. *With certain limitations, Army commanders may also change the weapons control status for their ADA weapons.* The general rule is that these commanders may impose more restrictive controls, but any changes to less restrictive controls must be approved by the region air defense commander.

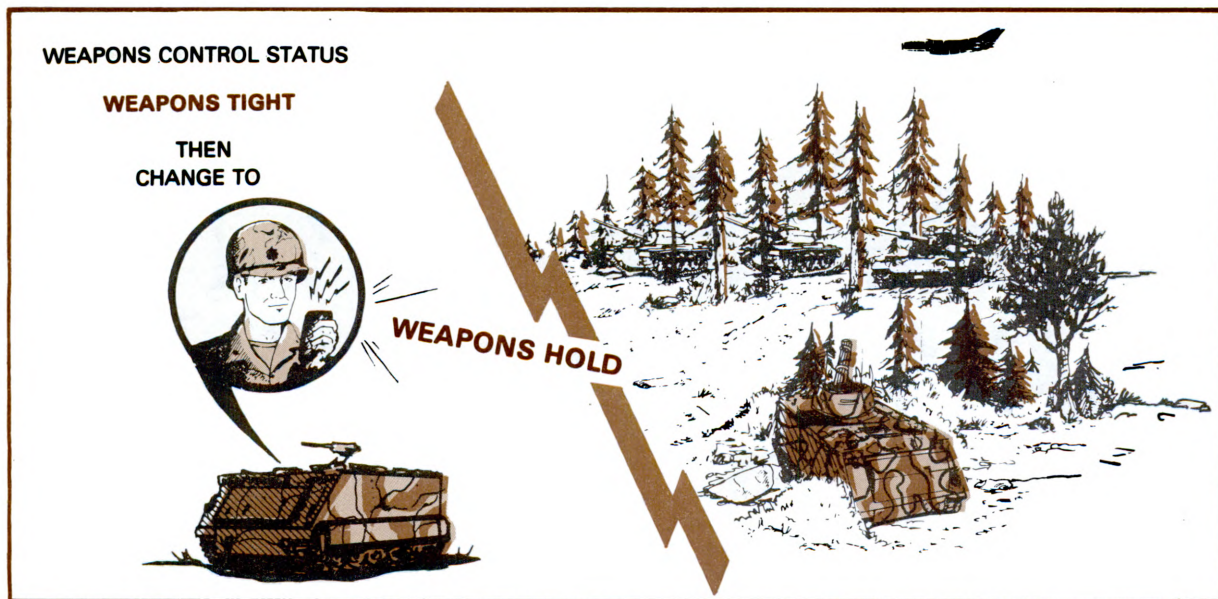
At the division level, changes to the weapons control status are usually

coordinated and disseminated by the DAME. For example, if the weapons control status is WEAPONS FREE and a flight of helicopters is to perform a resupply mission to 1st Brigade units, the DAME might initiate the following change:

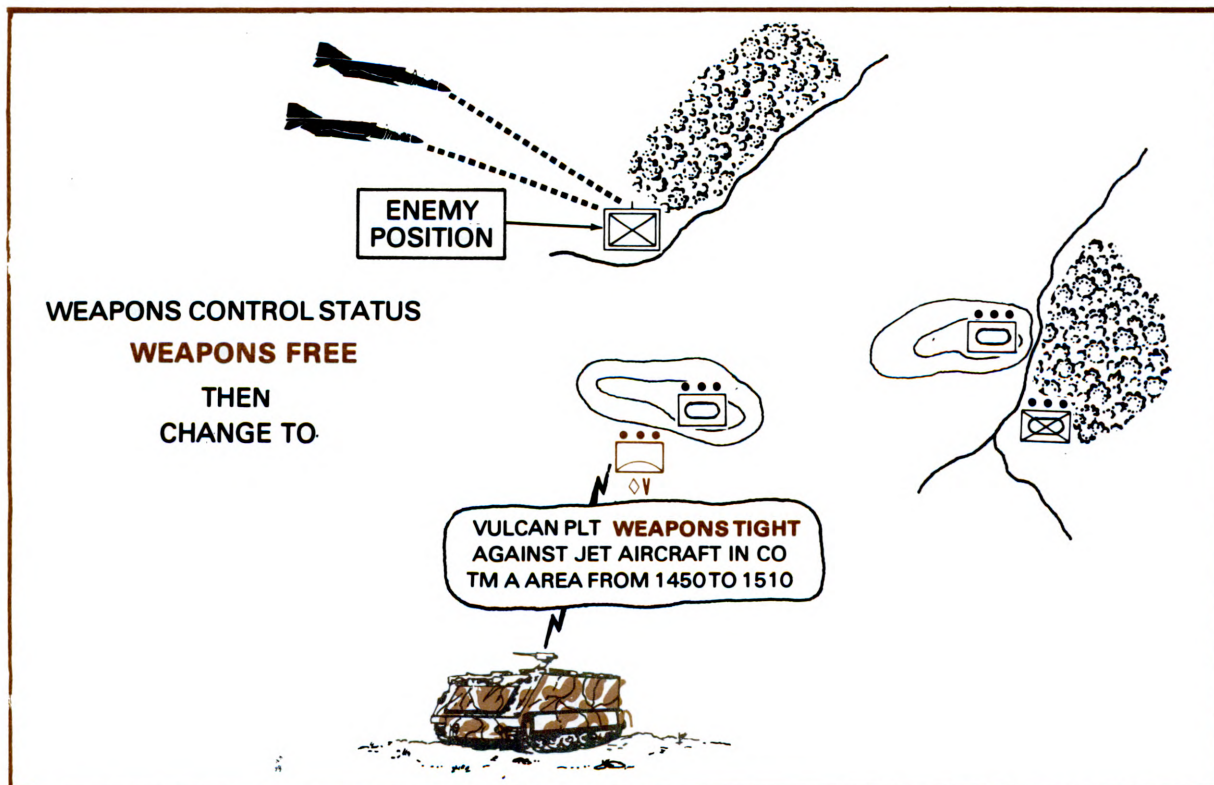
"WEAPONS TIGHT, 1ST BRIGADE AREA FOR HELICOPTERS ONLY—0800 TO 0900."

Brigade and battalion/squadron commanders may also have delegated authority to impose more restrictive controls on supporting ADA weapons. They might need to do this for two reasons:

- To keep from giving away a unit's position—



- To protect friendly aircraft operating in the brigade or battalion/squadron area—



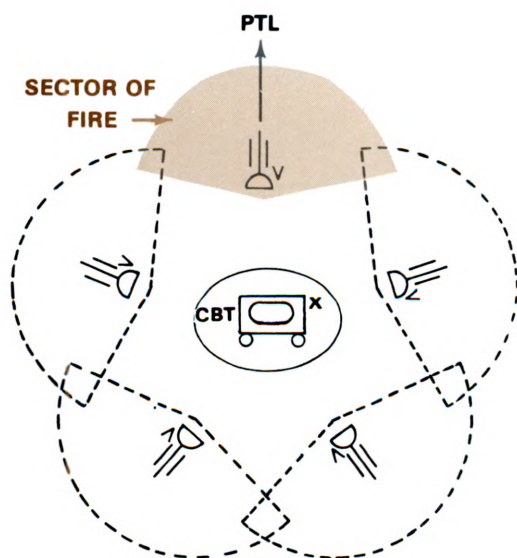
FIRE DISTRIBUTION

C/V battery commanders and platoon leaders can *control the distribution of squad fires by establishing sectors of fire and primary target lines (PTLs) for each weapon in a defense.* The use of these measures helps to insure that:

- **The most threatening aircraft are engaged first.**
- **All aircraft attacking a defended asset or unit are engaged.**

If a single aircraft is attacking the asset, all squads will attempt to engage it. However, squads must be prepared to defend against multiple attacks from different directions. The basic rules are—

- **First, the squad concentrates its fires on the most threatening aircraft within its assigned sector closest to its primary target line.¹**
- **Next, it engages targets closest to its primary sector.**



AIR DEFENSE WARNINGS AND STATES OF ALERT

The region air defense commander issues *air defense warnings* (ADW) to ADA units. These ADW indicate the probability of enemy air attack at any given time. Typical ADW are:

- RED - attack imminent or in progress.**
- YELLOW - attack probable.**
- WHITE - attack not probable.**

Within a division, these warnings are received by the DAME and the C/V battalion TOC from the air defense coordination officer and/or the Hawk battalion liaison officer and then retransmitted to C/V units down to squad level and to all Redeye sections.

States of alert specify the time available to be ready to engage targets. This is the time available to warm up electronic components, prepare ammunition for firing, and insure that sufficient crew members are present to fire the weapon. States of alert are defined in the tactical SOPs. Typical states of alert might include:

BATTLE STATIONS— ready to engage.

STANDBY— able to assume battle stations in 3 minutes.

The C/V commander has to determine which of his weapons must be immediately ready to do battle and which can be placed at a lesser state of alert. This determination can best be made at battery level based on the air defense warning and other tactical or maintenance requirements. If faced with a constant high-density threat, the commander may be forced to keep a large number of his weapons at "battle stations." When the probability of air attack is low, the commander may announce a reduced state of alert for some of his weapons to allow the crews to rest, resupply, or perform other tasks.

THE ENGAGEMENT DECISION

The following situations show how the Chaparral and Vulcan squad leaders use prescribed rules to make the engagement decision. This decision must be timely and

accurate. *The squad leader must thoroughly understand his important responsibilities in making the engagement decision.*

SITUATION 1

I am a squad leader in a Vulcan platoon supporting a tank-heavy company team. The platoon leader has announced the weapons control status as WEAPONS TIGHT. A single aircraft is approaching from the direction of enemy forces. It is flying very low at about 300 knots. I cannot identify it.

ACTION TAKEN

I cannot engage the aircraft since I can't identify it and it hasn't fired on the company team. However, I do not ignore it and direct the gunner to track the aircraft. If I do identify it as hostile, I will direct my gunner to engage.



REASON

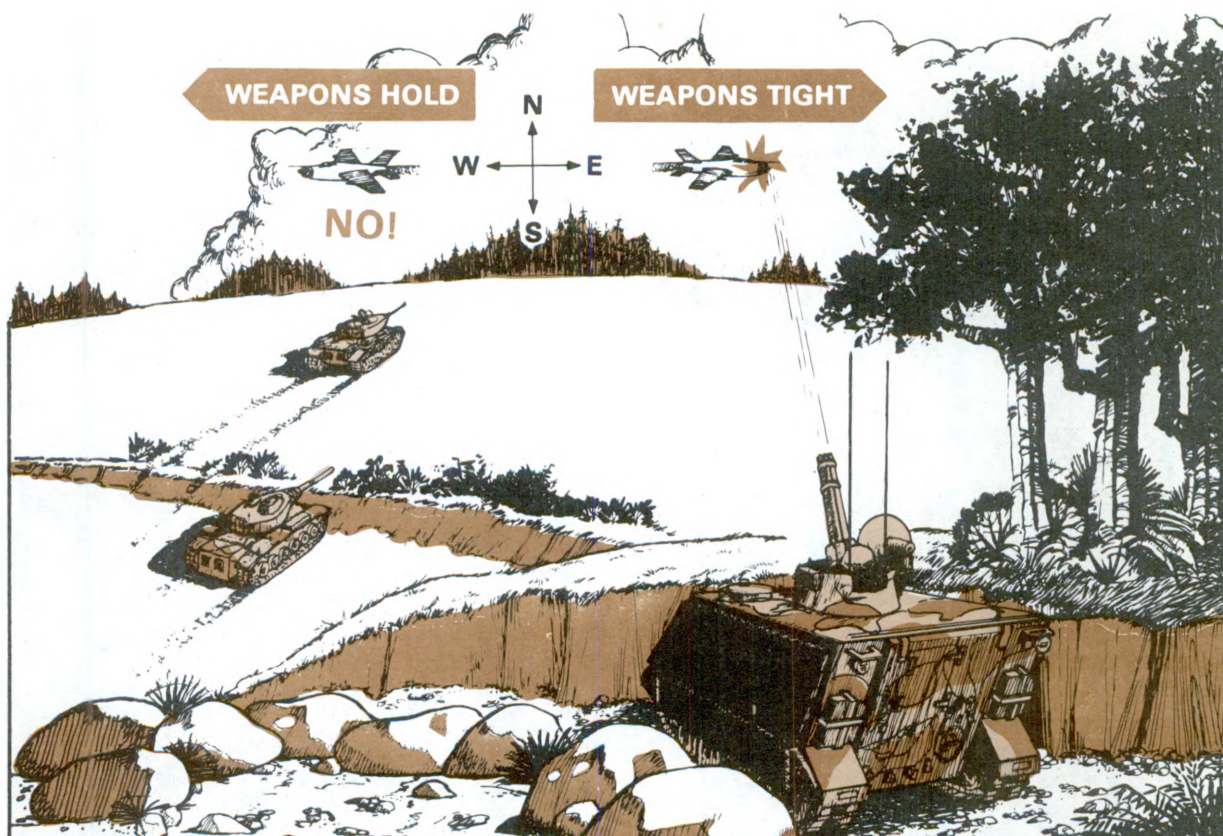
WEAPONS TIGHT requires that I make positive hostile identification, based on my hostile criteria, before engaging.

SITUATION 1
continued

At 1230, I receive a message from my platoon leader. He states "WEAPONS HOLD on all jet aircraft westbound between 1300 and 1330." I repeat back the message and have the lieutenant authenticate. At 1315, a jet aircraft I recognize as hostile approaches from the east. It is coming within range of my position.

ACTION TAKEN

I don't engage but continue to observe. My gunner tracks the aircraft and waits for my command to engage. I report the incident to my platoon leader. If the aircraft changes its heading, so that it is no longer westbound, I will direct my gunner to engage.

**REASON**

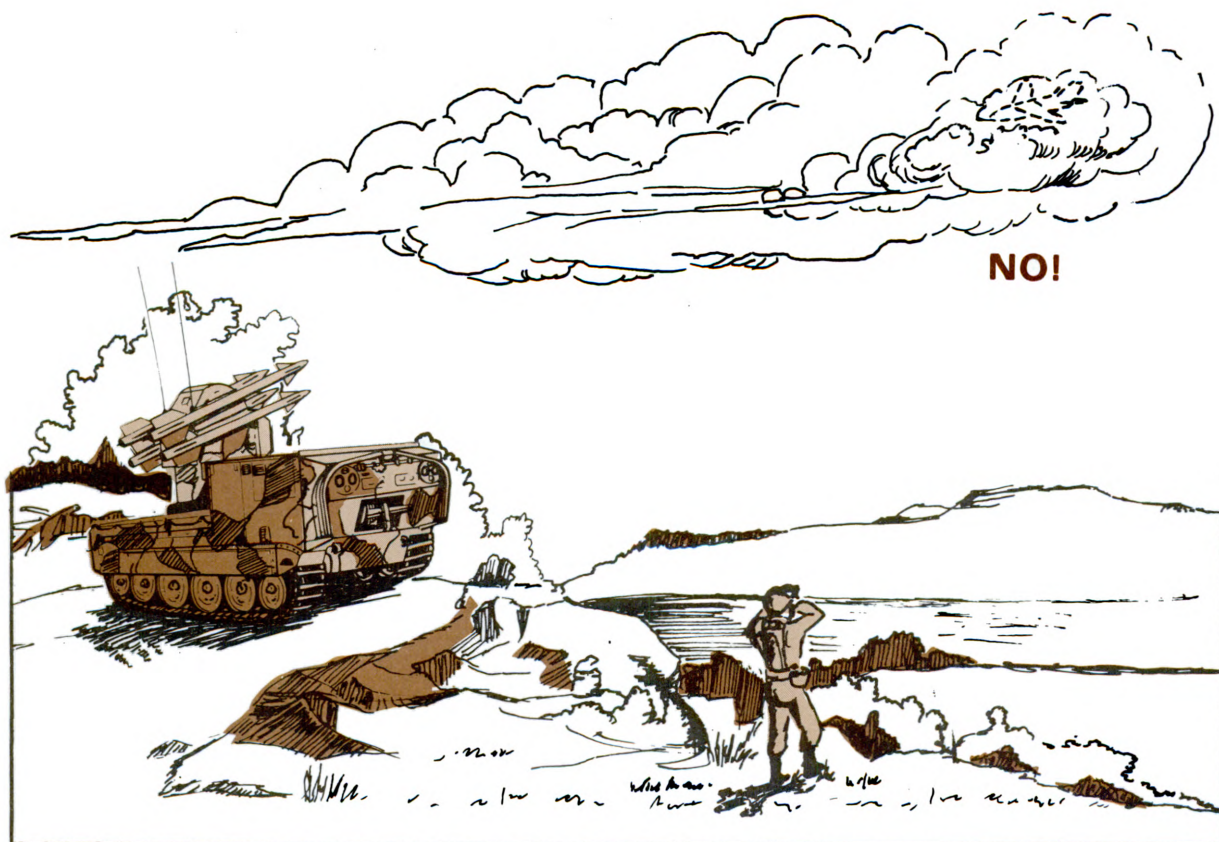
Changing the weapons control status to WEAPONS HOLD for westbound jets restricts me from engagement. WEAPONS HOLD means "do not fire except in self-defense." If the aircraft turns to a new heading, WEAPONS TIGHT applies. Since I have already positively identified him as hostile, I can engage.

SITUATION 2

I am a squad leader in a Chaparral platoon defending a field artillery battery. I am positioned on high terrain about 1.5 kilometers north of the battery. My primary sector of fire is 5,600 mils to 0800 mils and my PTL is 0 mils. The weapons control status is WEAPONS TIGHT. All squads in my platoon are at "Battle Stations." My TADDS indicates an unknown aircraft is approaching from the south.

**ACTION
TAKEN**

I alert my squad and we visually search to the south. One of my assistant gunners continues searching our primary sector. When I finally detect the aircraft, I identify it as one of our A7s, as do the other squad leaders. I continue to observe it until it leaves the area and report it as a friend to my platoon leader. Even if I could not identify it because of poor visibility, I still could not engage it.

**REASON**

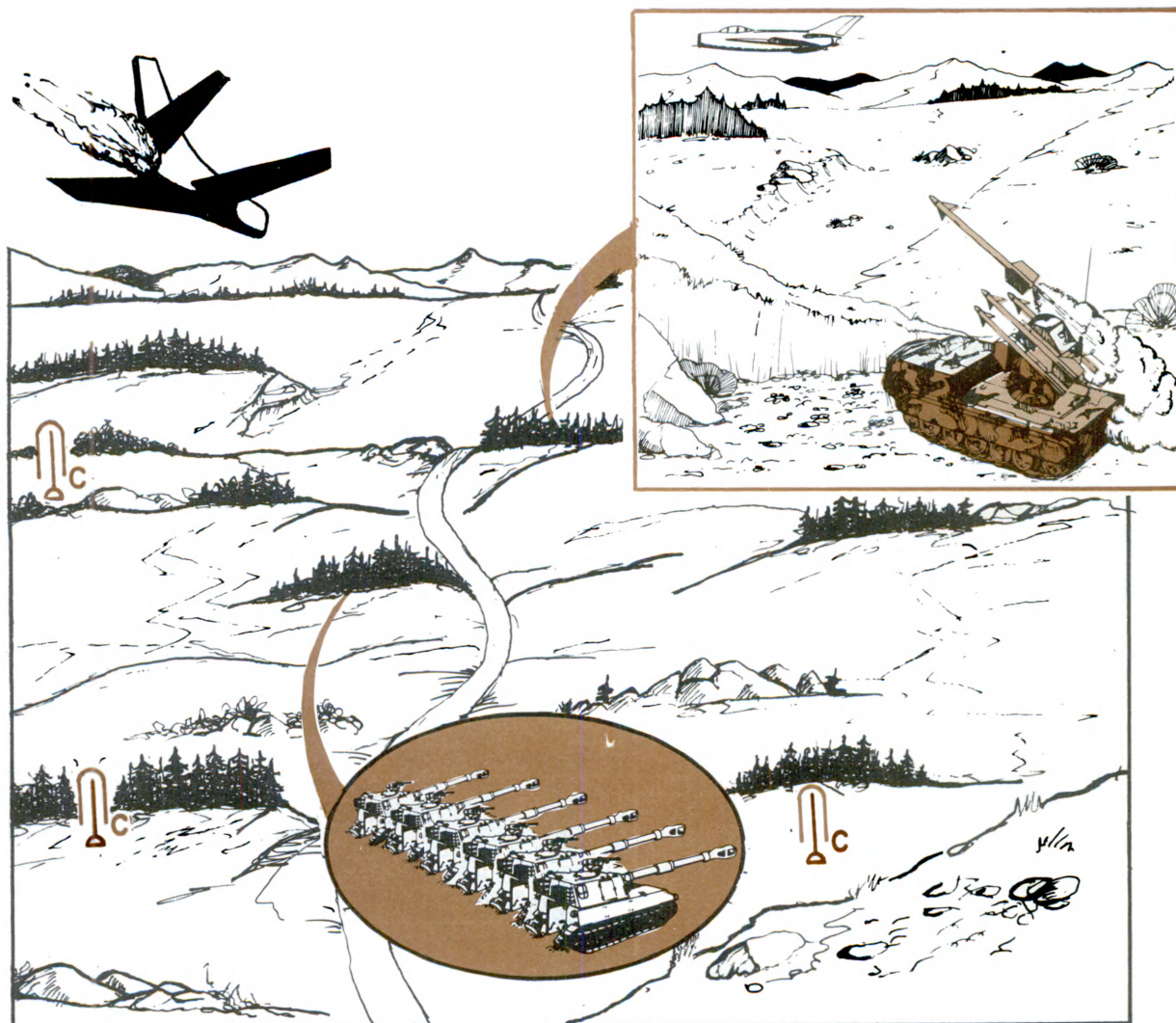
WEAPONS TIGHT requires a *positive* identification for engagement.

SITUATION 2
continued

Ten minutes later, my TADDS indicates that two unknown aircraft are approaching the artillery battery; one from the south and one from the east. I visually detect and identify both aircraft as hostile. Their distances from the battery are approximately the same.

ACTION
TAKEN

I direct my gunner to acquire and engage the aircraft approaching from the east.

**REASON**

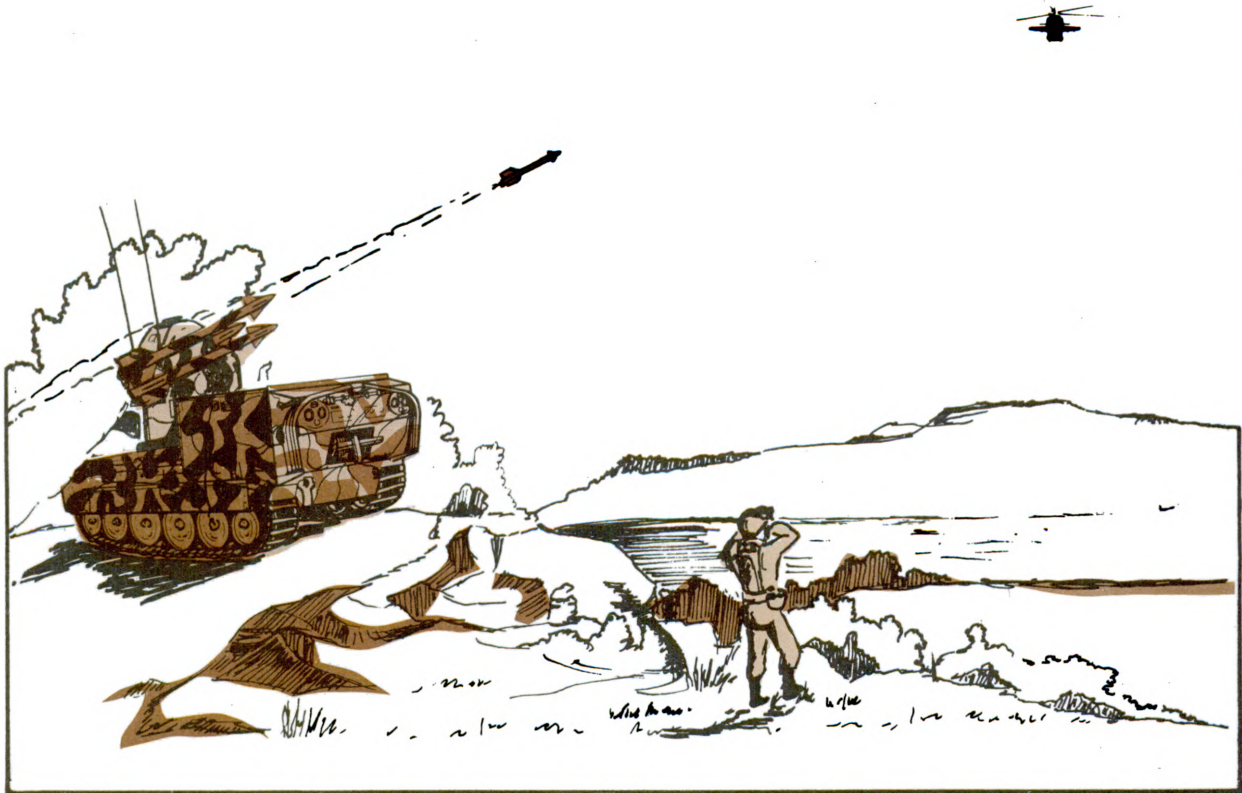
The basic rule for fire distribution is to first engage the target in your sector presenting the greatest threat to the defended asset. I engage the target closest to my primary sector of fire. All the other squad leaders follow the same rules. Since they have different sectors, fire on both targets is assured.

SITUATION 2
continued

I receive a message from my platoon leader stating a flight of enemy helicopters had been detected by Hawk radars. He had received a message to go to WEAPONS FREE for all helicopters only; all friendly helicopters had been told to stay out of our area. I authenticate the message and continue to search my primary sector. About 15 minutes later, my TADDS indicates two slow-moving, unknown aircraft approaching my position from the north. I observe a helicopter. I am not sure what kind of a helicopter it is but I can tell it is not a friendly helicopter.

ACTION
TAKEN

I direct my gunner to acquire and engage the helicopter when in range.

**REASON**

I was authorized to order the engagement because WEAPONS FREE means I should engage aircraft not positively identified as friendly.



II CHAPTER 6

EMPLOYMENT PRINCIPLES and GUIDELINES

Army air defense assets are few; seldom will the commander have all the air defense weapons he really needs to do the job—he must make the most of what he has. To do this, the air defense commander must grasp the basic principles of air defense employment and translate them into tactics and techniques that will optimize the efficiency of his organization and its weapons.

This chapter discusses the employment of Chaparral and Vulcan in support of the maneuver forces. Although the discussion is oriented primarily toward the Chaparral/Vulcan battalion organic to armor, infantry, and mechanized infantry divisions, the same basic principles, tactics, and techniques generally apply to nondivisional battalions and battalions organic to other type divisions. The material contained in this chapter will be expanded upon and applied in follow-on discussions of the Chaparral/Vulcan battalion in support of offensive and defensive operations in later chapters.

CONTENTS

	PAGE
Basic Principles	6-1
Organizing for Combat	6-6
Corps ADA	6-10
Forward Area Alerting Radar	6-11
Defense of Stationary Assets	6-12
Defense of Units on the Move	6-20

BASIC PRINCIPLES

Four fundamental principles underlie the effective employment of air defense

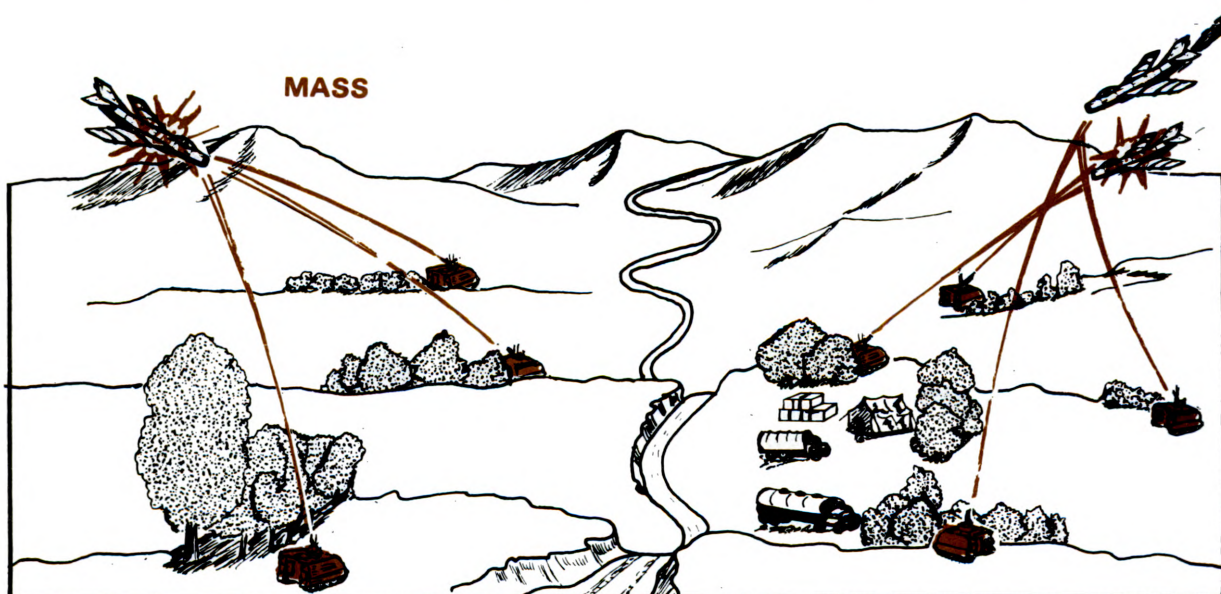
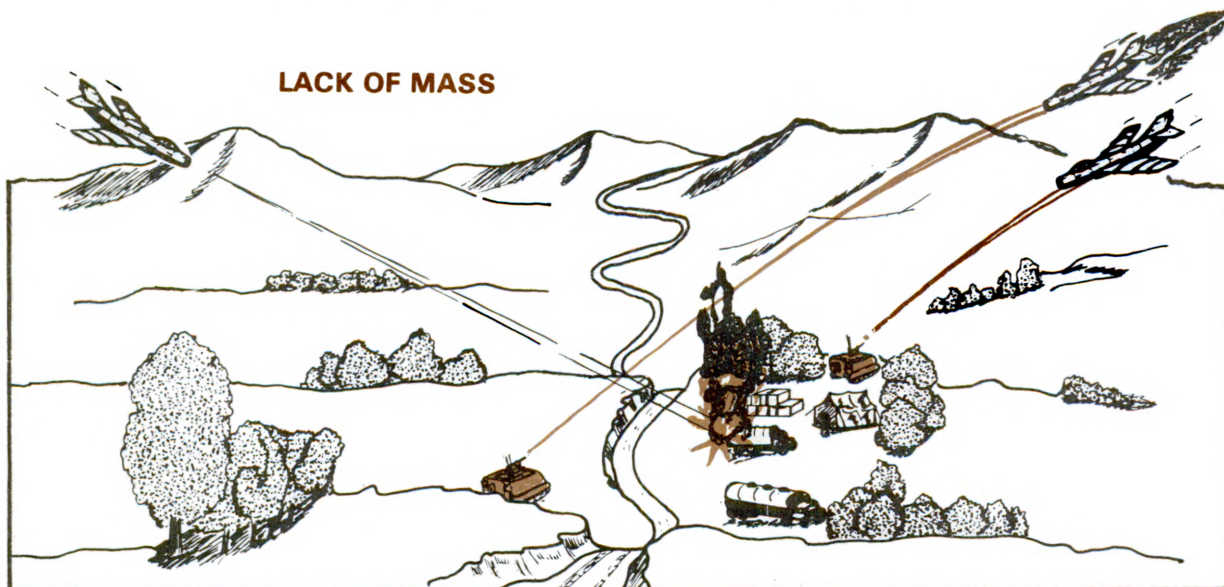
weapons on the modern battlefield—the principles of mass, mix, mobility, and integration. In practice these principles are interdependent and the manner in which they are applied will, in large measure, determine the success of air defense in meeting its objective.

MASS

Mass is achieved through the allocation of a sufficient number of air defense weapons to the defense of each priority asset to adequately protect it against the air threat. This principle applies to all weapon systems at every echelon of the air defense organization. It entails the provision of mutual support or overlapping fire between weapon systems and all-around defense in depth. It seeks to establish a favorable ratio

of defensive weapons to attack aircraft in the protection of assets that are critical to the supported force. As a general rule, short-range air defense weapons should fight by battery and platoon to maintain a continuous capability to place a volume of

fire on the attacker. The deployment of short-range weapons in less than platoon strength risks the sequential or simultaneous neutralization of both the air defense weapons and the defended asset by aircraft attacking in numbers.

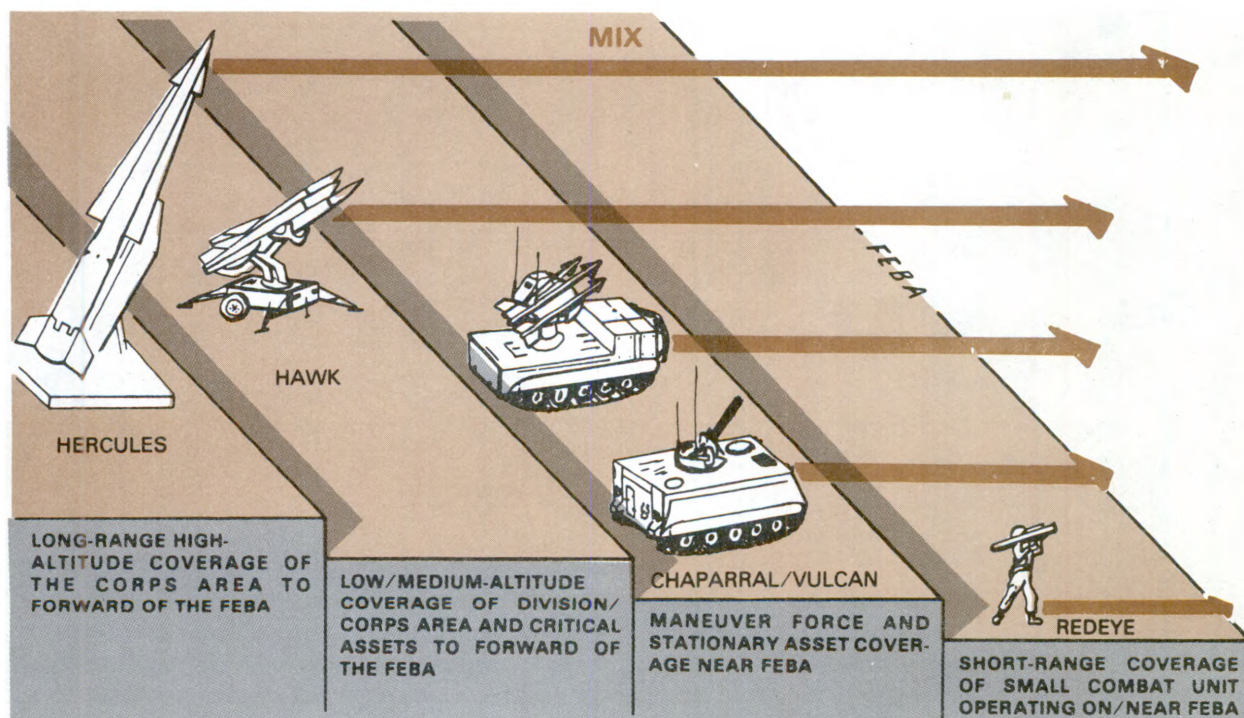


To assure a continuous capability to place a volume of fire on aircraft attacking in numbers, Vulcan and Chaparral weapons are employed in battery and platoon strength for the defense of critical assets.

MIX

The mixing of complementary weapon systems goes hand-in-hand with the principle of mass. By employing a variety of weapon systems in sufficient mass, ADA complicates the problem of the attacker who must consider the characteristics of each weapon system in the formulation and execution of his offensive strategy. The attacker may be able to optimize his tactics and techniques to minimize the effects of one or more defensive systems but, when faced with a broad array of air defense weapons, his price of admission into the defended area rises dramatically. Thus, a mixture of long-, medium-, and short-range missiles and guns, all differing in technology and operational characteristics, as well as in range and altitude capabilities, offers the best overall air defense for priority assets.

Chaparral and Vulcan are most effective when employed beneath an air defense umbrella provided by long- and medium-range air defense missile systems. The area coverage afforded the division by the direct support Hawk battalion permits the division air defense artillery commander to better concentrate his weapons on and around selected high-priority assets for their close-in defense. The effectiveness of the Hawk system against aircraft operating at low and medium altitudes forces the attacker to approach the target at very low altitudes, thus limiting his ability to locate and destroy the target while increasing his vulnerability to the fires of short-range air defense weapons.



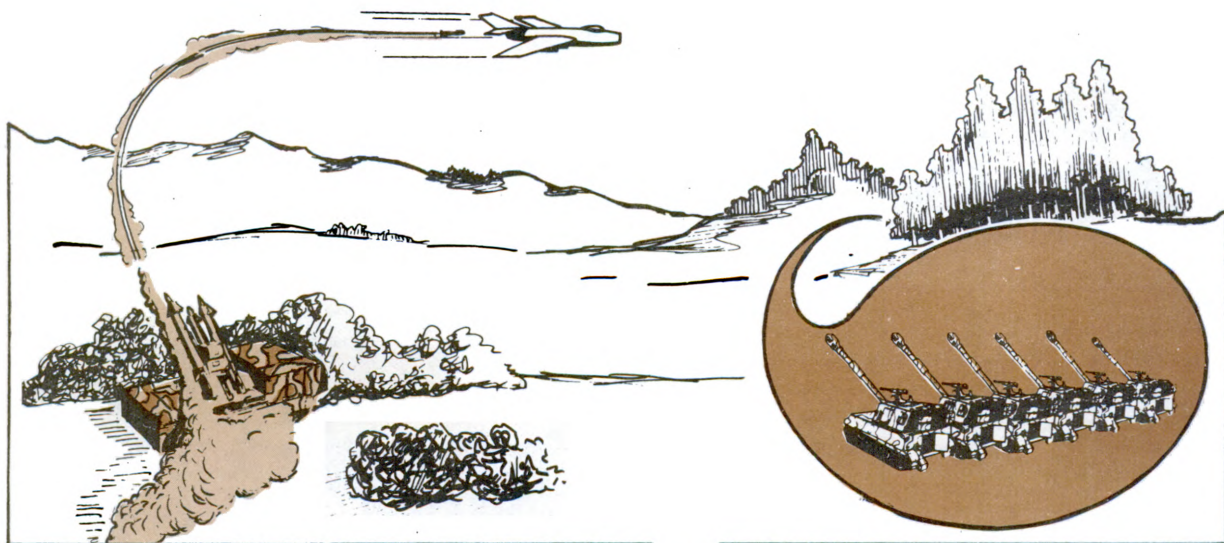
Chaparral and Vulcan weapons are most effective when employed under the "umbrella" coverage of the Hercules and Hawk missile systems and when employed together for the close-in defense of critical assets—the capabilities of one system will offset the limitations of others.

MOBILITY

To permit the application of the principles of mass and mix in the dynamic atmosphere of the modern battlefield, air defense systems must be mobile. Continual movement of weapons is required to provide

protection for maneuvering elements, to accommodate frequent changes in air defense priorities and missions, and to enhance the survivability of these systems in both the ground and air battle.

MOBILITY



Chaparral Defending Field Artillery Unit.



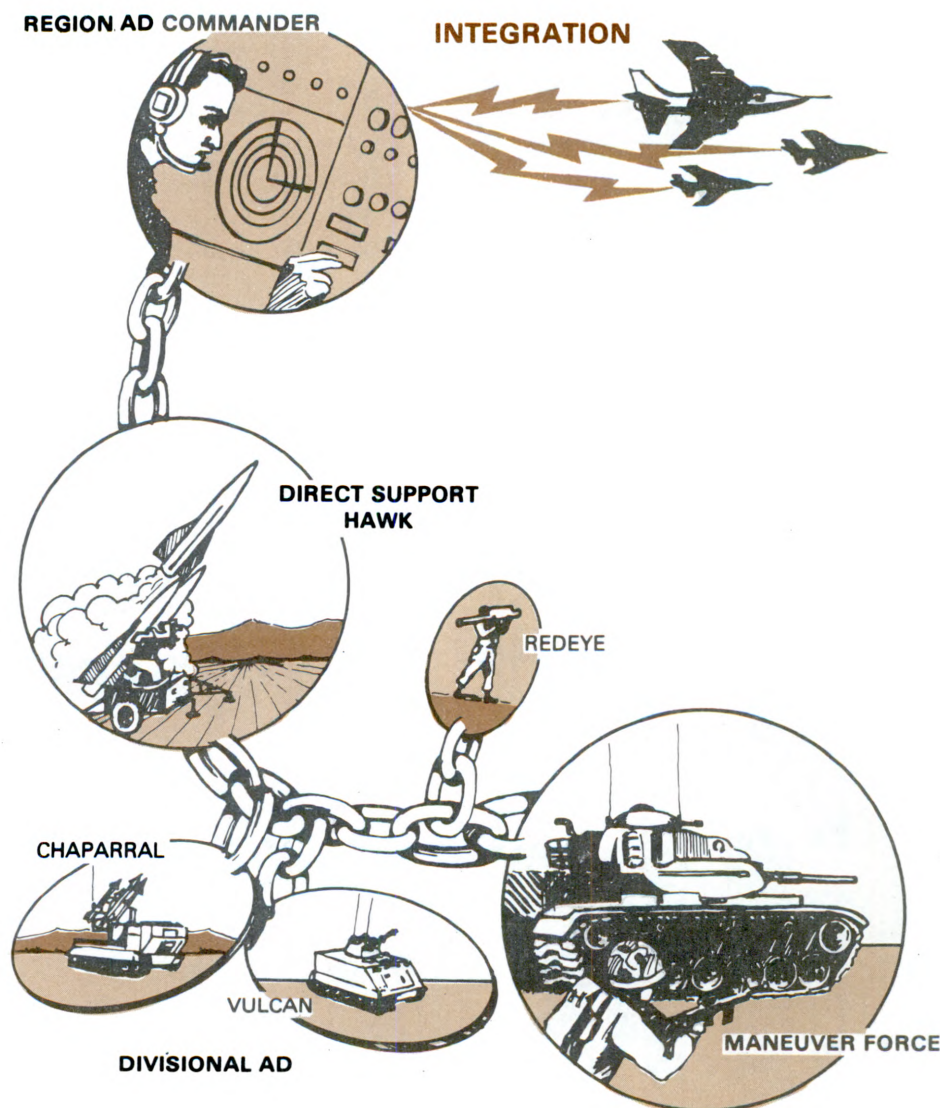
Vulcan Defending Maneuver Unit.

When employing Chaparral and Vulcan, the relative mobility of the two systems is considered in determining the assets to be protected by each system.

INTEGRATION

Massed, mixed, and mobile Army air defense systems must be integrated into a cohesive organization responsive both to the needs of the maneuver commander and to the orders of higher air defense authority. The nature of the air threat, requiring almost

instantaneous reaction by the defender, dictates that effective command, control, and coordination links be established between all levels of the air defense organization and with each maneuver element receiving air defense support.



Chaparral/Vulcan units are integrated into the overall air defense structure while providing dedicated air defense for specified critical assets of the ground force commander.

ORGANIZING FOR COMBAT

With guidance from the division commander, the C/V battalion commander develops air defense priorities and determines how air defense resources should be used to best support the accomplishment of the division's mission. He does this in consultation with the G3 and, as necessary, the commanders of the brigades, division artillery, and support command. One of his most important tasks is developing a strong and viable ADA organization for combat.

In the following discussion, actions are presented in the sequence in which they will generally occur in the development of an organization for combat—determination of priorities, allocation of resources, and task organization. In actual practice, they may be interwoven and accomplished simultaneously. At the division level and below, this is not a long, drawn-out process; it can be done quickly by experienced commanders.

Air defense priorities provide the basis for the C/V organization for combat. Since the number of assets which may require C/V protection exceeds the number of weapons available to adequately protect them, a priority listing must be developed.

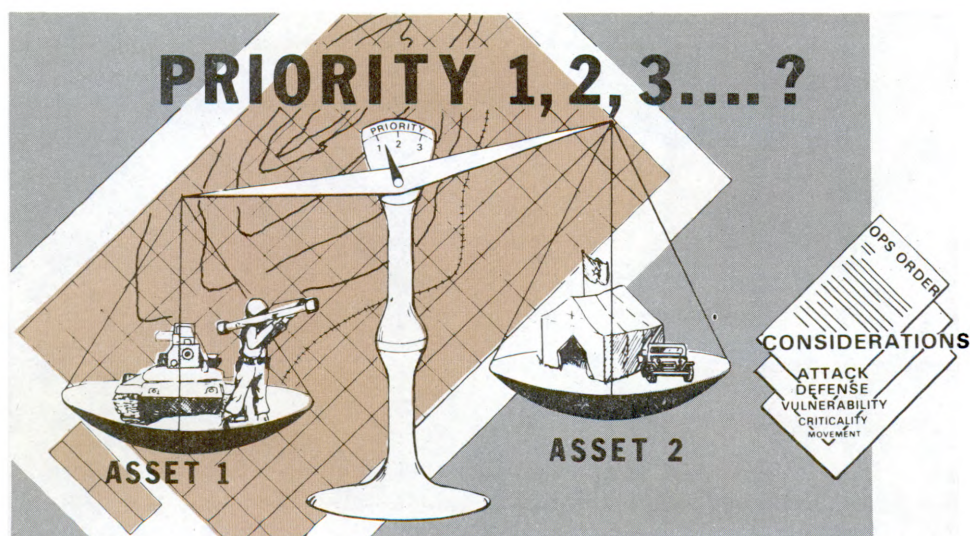
Air defense priorities are established for every division operation and for each course of action considered by the commander and staff. The development of the priority listing is essentially a matter of assessing each element of the division as a potential target for enemy air attack. Factors considered include:

CRITICALITY

How important is the asset to mission accomplishment? ***This is the foremost consideration.*** The C/V battalion commander can assess most of the other factors on his own, but he must rely heavily on the G3 and others for advice on the criticality of the various assets to the success of a particular operation or course of action.

EXAMPLE

- In the defense, against which brigade(s) is the main thrust of the enemy attack expected?
- In the offense, which brigade(s) will be making the main attack?
- Are any supplies, such as POL and ammunition, critically short? How vital are the stocks available in DISCOM and brigade trains to the success of the mission?



VULNERABILITY

How susceptible is the asset to damage or destruction by air attack?

CONSIDER

HOW HARD IS THE ASSET—tank battalion versus DISCOM unit/facilities?

WHAT WILL BE THE ASSET'S MISSION—the asset's normal mission or what its specific mission is during execution will affect its vulnerability (e.g., attack, defend, provide fire support, command and control, combat service support, a unit in reserve)?

HOW MOBILE—ability to disperse or move quickly to different locations? Does the mission allow dispersion?

PASSIVE MEASURES—is it relatively simple to camouflage; does the terrain provide adequate natural camouflage or concealment during mission execution?

OTHER AIR DEFENSE WEAPON PROTECTION—how well is it covered by the DS Hawk battalion against low-altitude air attack? Does a unit have organic Redeye?

EXAMPLE

- Does the threat consist of high-performance aircraft, helicopters, or both?
- How is he likely to use his attack aircraft—against maneuver elements, combat support and combat service support units, or command and control facilities?

The *development of air defense priorities is not necessarily a step-by-step process* where each of the above factors is considered one at a time, but *may be a simultaneous consideration of all factors, with some factors being more heavily weighted than others* in differing situations. For instance, a highly mobile, dispersed, and well-camouflaged field artillery battalion may be deemed so *critical* to the success of the operation that it is accorded a high priority even though its *vulnerability* to air attack is low.

Once the priority list has been developed and approved by the division commander, *resources can be allocated*. The C/V commander analyzes each priority asset in succession to determine: .

What type weapons should be used to defend it and how many? In answering this question *he reviews the factors used in establishing the priority list and also considers:*

- The *need for massing weapons* in the defense of each asset.
- The *desirability of having a mix of guns and missiles* in the defense of each asset. In this connection, he considers—
 - *Redeye sections* organic to armor, infantry, and tube artillery battalions and cavalry squadrons.

RECUPERABILITY

If an asset is attacked by air and sustains damage or is destroyed, how long will it take to repair or replace it (e.g., a key bridge versus an airstrip)?

ENEMY AIR

What are the threat tactics and ordnance, and the enemy's capability to project his air resources against the supported unit's asset?

- *Using Chaparral with Vulcan* in defending units or other assets *in rear areas*, whether or not Redeye is also available.

- The *capabilities and limitations of each weapon* in defending the various assets (*primarily based on mobility and survivability*).
- *Other air defense protection available* such as Hawk coverage, organic Redeye, small arms for air defense, and passive air defense measures.
- The *possibility of protecting more than one asset with a battery or platoon defense (defense "sharing")*.

The commander continues the process of analyzing each asset in order of priority and allocating resources to its defense until he has used all his available weapons. He reviews the allocations and may repeat the process several times before he develops the allocation which provides the best defense of the greatest number of priority assets.

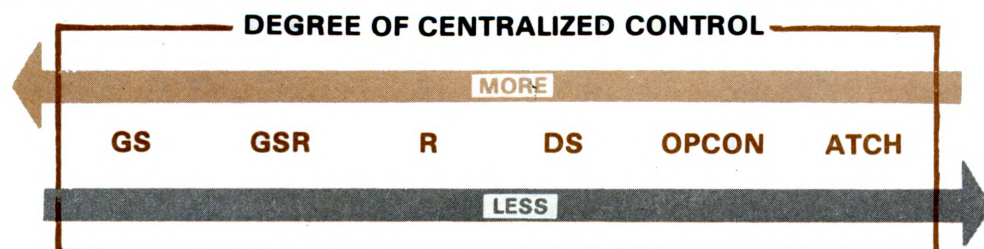
Having determined how his weapons should be allocated to the defense of each priority asset, the C/V commander now has the basis for his task organization. The need to cross-attach platoons between batteries will, in most instances, have evolved during the allocation process. With advice and assistance from his battery commanders, he must now answer the question:

Which of my units will I use to defend each asset?

In task organizing the commander—

- *Seeks to minimize changes in his current task organization and the shifting of unit locations.*
- *Visualizes support requirements for future operations* based on the scheme of maneuver; he considers not only what his units will be doing initially but also what they may be required to do in the next phase of the operation.
- *Anticipates possible changes in the scheme of maneuver and concomitant changes in air defense priorities.* He must retain sufficient control of his units to rapidly react to these changes.

The task organization establishes the command relationship between C/V commanders and the commanders of supported units. Four standard tactical missions are normally used to implement the task organization—general support (GS), general support-reinforcing (GSR), reinforcing (R), and direct support (DS). Occasionally a C/V unit may be placed under the operational control of, or attached to, a maneuver force. The type of command relationship established will depend primarily on the degree of control the force (e.g., division) commander desires to retain over the employment of the C/V unit and upon logistical considerations.



ADA TACTICAL MISSION/RESPONSIBILITIES

An ADA unit with a Tactical Mission of---	Responds to AD Rqmts directly from---	Establishes Liaison and Communi-cation with--	Priorities for AD Established by---	Is Positioned by---
General Support	Force ADA commander	As required	Force commander	Force ADA commander
General Support-Reinforcing	Force ADA commander and reinforced unit commander	Reinforced ADA unit	1. Force commander 2. Reinforced ADA unit commander	Force ADA commander
Reinforcing	Reinforced ADA unit commander and Force ADA commander	Reinforced ADA unit	1. Reinforced ADA unit commander 2. Force commander for priorities outside the reinforced unit's zone/sector	Reinforced ADA unit commander
Direct Support	Supported unit commander and Force ADA commander	Supported unit	1. Supported unit commander 2. Force commander for priorities outside the supported unit's zone/sector	ADA unit commander

GENERAL SUPPORT (GS)

A Chaparral or Vulcan battery with a GS mission defends units or other assets as specified by the commander assigning the mission and remains under the close control of the C/V battalion commander. A C/V unit with a GS mission can be used to rapidly respond to changes in either the scheme of maneuver or the air threat. This mission is commonly used when the C/V unit is to protect division-level control and support elements in brigade and division rear areas.

GENERAL SUPPORT-REINFORCING (GSR)

This mission differs from the GS mission in that a C/V unit assigned a GSR mission augments the fires of another C/V unit. This mission can be used when the division commander desires to provide additional air defense for a brigade that has a Vulcan battery in direct support and, at the same time, retain close control over the unit. The brigade asset to be protected by the GSR unit is specified and the C/V battalion commander retains positioning authority

over the unit to be able to rapidly respond to changes in mission requirements.

REINFORCING (R)

This mission differs from the GSR mission in that a C/V unit assigned this mission is positioned by the reinforced C/V unit to protect assets specified by the supported unit commander. This mission is also used when the division commander desires to provide additional air defense for a brigade that has a Vulcan battery in direct support. The reinforced Vulcan battery commander assigns tasks and positions weapons of the reinforced unit, based on the brigade commander's air defense priorities.

DIRECT SUPPORT (DS)

A C/V unit with a DS mission provides close and continuous support to a maneuver unit and coordinates its movement and positioning with the element it supports. The DS commander positions his weapons as necessary to properly support the maneuver element's priorities. This mission is appropriate for a Vulcan battery supporting a brigade.

OPERATIONAL CONTROL AND ATTACHMENT

When an ADA unit is placed under the operational control of another unit—administrative, training, and logistical responsibility are retained by the parent organization—unless modification is outlined in the order establishing the relationship. The commander's authority extends from planning through execution as required for mission accomplishment. Operational control would be appropriate for tactical operations of generally short duration requiring dedicated air defense, such as an ADA unit assisting a maneuver force in securing a key bridge. A unit will normally be placed under operational control for a specific period of time or until a specific mission is accomplished, at which time it will revert back to control by its parent organization.

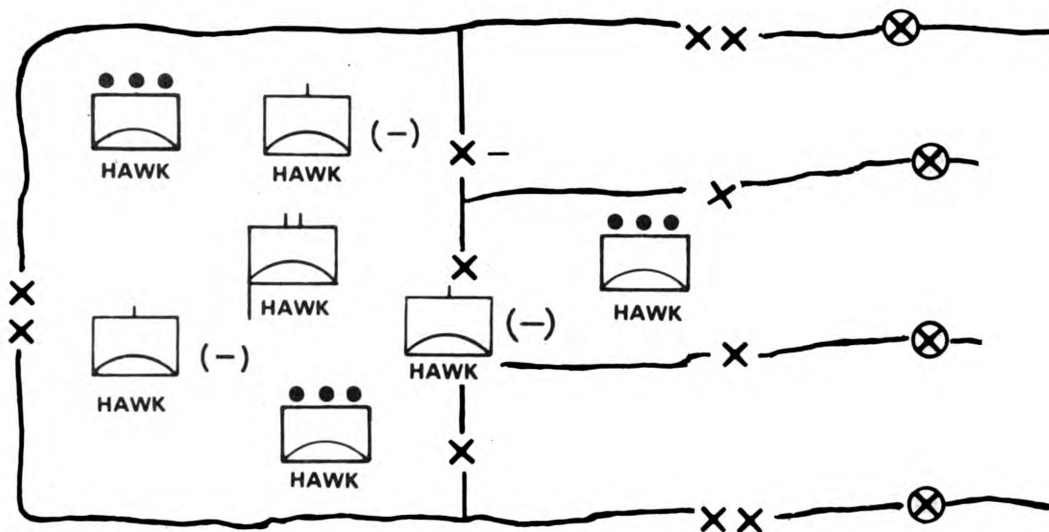
When an ADA unit is attached, the maneuver force is responsible for providing administrative and logistical support to the ADA unit. ADA units may be attached to a

maneuver force when command and control requirements cannot be adequately met by the assignment of a standard tactical mission to the ADA unit or by placing the ADA unit under the operational control of the force. A Vulcan battery might, for example, be attached to a task force going on an extended, isolated operation where effective support could not be provided by the Chaparral/Vulcan battalion.

CORPS ADA

THE DIRECT SUPPORT HAWK BATTALION

When the commander of a Hawk battalion is assigned the mission of direct support of a division, he will be informed by his higher headquarters (normally the ADA group supporting a corps) of the division's mission and the general nature of its employment during any particular operation. He then relies on the divisional C/V battalion commander for details on the division's plans and operations.



DS Hawk Battalion.

The batteries and platoons of the battalion will normally be deployed to provide area coverage of the division against low- and medium-altitude air attack by high-performance aircraft. These units will ordinarily be positioned in the division rear area. It may, however, sometimes be necessary to position Hawk units farther forward into the brigade areas to extend coverage over the forward-most maneuver elements.

REFERENCE

Detailed information on the employment of the Hawk battalion can be found in FM 44-90.

THE NONDIVISIONAL C/V BATTALION

Nondivisional C/V battalions assigned or attached to the ADA organization supporting a corps (usually an ADA group) *will normally be used to defend priority assets in corps rear areas.* When employed in this manner, the battalion is assigned a general support mission and the specific assets to be defended are spelled out in the tasking directive. *Corps C/V units* (battalion or individual batteries) *may*, if the situation and corps air defense priorities dictate, *be tasked to:*

- *Provide protection for a separate brigade, regiment, or other force without its own organic Chaparral and Vulcan units.* The ADA unit may be attached to the force or be placed under its operational control, or it may be assigned a tactical mission in direct support of the force.
- *Augment the Chaparral/Vulcan capability of a division.* This augmentation may be accomplished by—
 - *Attachment of the C/V unit to the division* with further attachment to the divisional C/V battalion.

- *Placing the C/V unit under the operational control of the division* with further OPCON to the C/V battalion commander.
- *Assigning the C/V unit a tactical mission of reinforcing or general support-reinforcing the divisional C/V battalion.*

The type of command relationship established will depend primarily on the degree of control the corps commander desires to retain over the ADA unit and upon logistical considerations.

FORWARD AREA ALERTING RADAR

The FAAR sections have the mission of providing time-sensitive information to the weapon system crews they serve. This information—

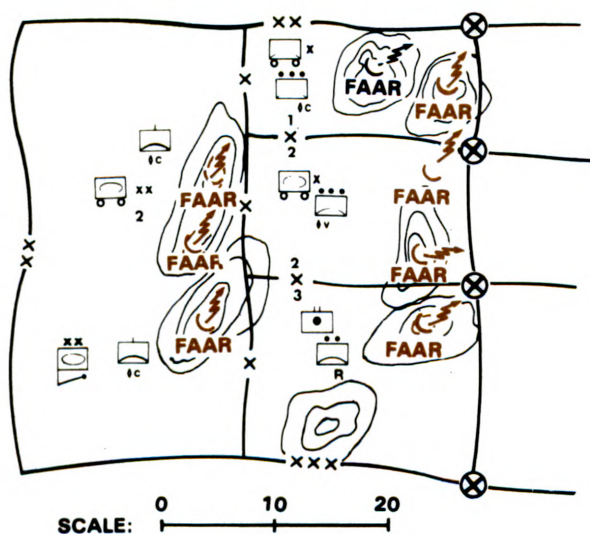
- Alerts crews of impending air attack.
- Provides tentative aircraft identification.
- Provides aircraft location so observers at the weapon can visually search a relatively small sector of airspace.

To accomplish this mission, *the eight forward area alerting radar (FAAR) sections of the C/V battalion are normally retained under the direct control of the FAAR platoon leader.* Under the supervision of the battalion S3, he positions the radars to provide coverage throughout the area in which weapons are deployed—

- *To pass alert data to the fire units in time to insure effective reaction to the air threat.* To meet this requirement, *radar coverage should extend beyond the fire unit positions at least 10 kilometers* in the expected direction of air attack.
- *To provide continuous alert warning* if one system goes out or must be moved to better support the operation. When possible, *FAARs should be employed in*

pairs so each system is positioned *not more than 9 kilometers apart for mutual radar coverage*.

■ *To provide security from small arms and automatic weapons fire.* When possible, radars should be employed *in secure areas no closer than 2 kilometers from the FEBA or line of contact*.



FAARs are normally deployed under battalion control to provide area coverage.

As an alternative, FAAR sections may be attached to or placed under the operational control of a battery. This is done only when lines of communication are extended such that the S3 and the FAAR platoon leader cannot control and position the radars to effectively support the battery. When employed in this manner, at least two FAARs should be allocated to the battery to afford it a continuous coverage capability. One of the FAARs can remain in position while the other displaces.

DEFENSE OF STATIONARY ASSETS

The discussion in this paragraph is applicable to the defense of fixed assets such as bridges and airfields, and of units, command and control elements, and support activities when they are in position in rear areas. The discussion applies to both divisional and nondivisional Chaparral and Vulcan units.

Defenses of assets in rear areas are designed primarily to counter low-level attack by jet aircraft. These assets may be attacked by enemy aircraft as targets of opportunity; frequently, however, enemy intelligence will have pinpointed an asset's location and will conduct preplanned air strikes against it. Normally, it must be assumed that the enemy can attack the asset from any and all directions. Attack on the first pass by enemy aircraft is likely.

The location of these assets behind the line of contact normally permits positioning of weapons out from the asset in any direction. The size and shape of the asset will vary; seldom, however, will the dimensions of divisional assets to be defended by Chaparral and Vulcan exceed 1 kilometer in diameter.

Defenses may consist of Vulcan only, Chaparral only, or a combination of these weapons to form mixed defenses. Also, Vulcan will often be employed with Redeye to provide a gun-missile mix for the defense of stationary assets. Chaparral and Vulcan weapons are employed in at least platoon strength and, preferably, battery strength for the defense of most assets of this nature.

Defense design and selection of positions for this type of asset *can ordinarily be more deliberate than when supporting maneuver units.* The defense is normally designed and tentative weapon positions selected using a map. The precise locations and suitability of positions are then determined by ground

reconnaissance (see Appendix A, Reconnaissance, Selection, and Occupation of Position).

In planning a defense of a stationary asset, commanders must—

CONSIDER

Requirements for siting individual weapons (position requirements)

AND

The relative location of each weapon to other weapons in the defense and to the asset to be defended (defense design).

Positions selected for individual Chaparral and Vulcan weapons squads should provide for—

Observation and fields of fire. This is the primary consideration. Look for positions that permit the crew to see and the weapon to be fired in any and all directions. Make sure that the weapon can cover its primary sector of fire.

Cover and concealment for the weapon and crew.

Defense against ground attack. When possible, tie weapon positions in with those of the defended unit and take advantage of protection afforded by these units against ground attack.

Entrance and exit routes that will permit the weapons to enter and leave the position expeditiously.

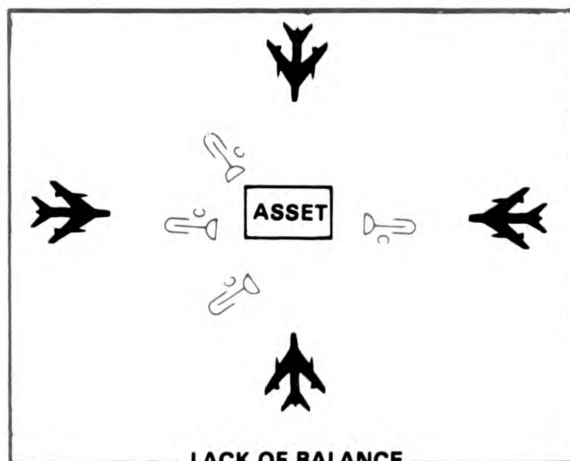
Communications with the platoon CP and with forward area alerting radars. In most cases, line of sight with these elements for communications by FM radio or radio data link is required.

The technical requirements of the weapon systems (e.g., backblast from Chaparral firing).

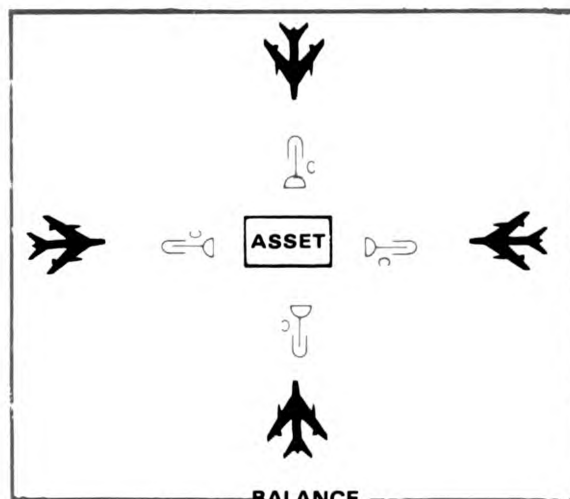
There are *certain general guidelines* that *can and should be considered in designing the defense*. The *use of these guidelines helps to insure* that a defense will have *adequate mass*—

BALANCE

Achieve defensive balance by positioning weapons for all-around defense and so approximately equal fire power can be delivered in all directions. Unless terrain prevents low-level air attack from certain directions, which will seldom be the case, it must be assumed that enemy aircraft can attack the asset from any direction.



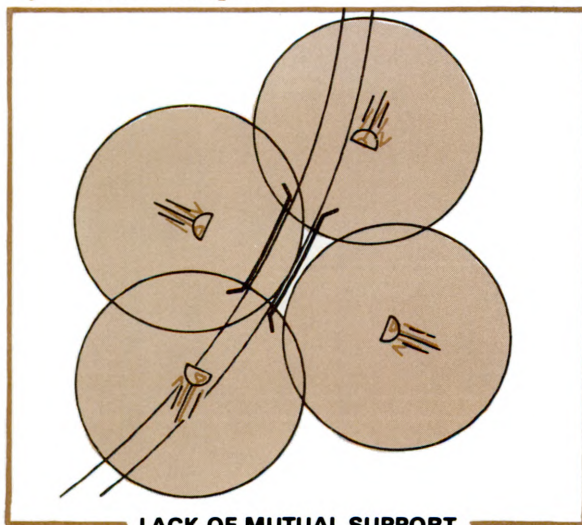
LACK OF BALANCE



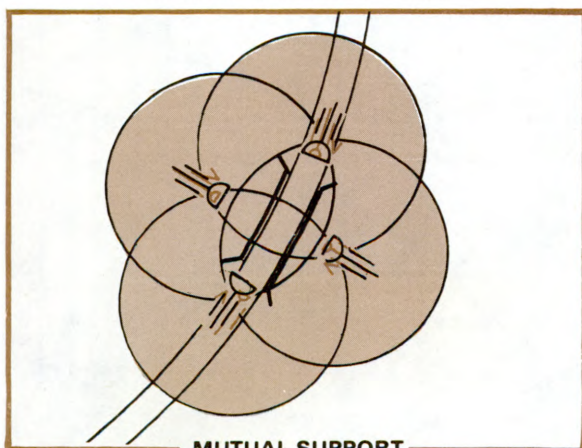
BALANCE

MUTUAL SUPPORT

Obtain mutual support by positioning weapons so each weapon is covered by another like weapon. Mutual support permits the massing of the fires of two or more weapons on an attacker and prevents a gap in the defense when one weapon is temporarily out of action for any reason. When a weapon is out of action, it is protected by another weapon.



LACK OF MUTUAL SUPPORT



MUTUAL SUPPORT

With Vulcan, mutual support can normally be obtained by separating the weapons by no more than 1,000 meters and, with Chaparral, no more than 2,000 meters. In the case of Chaparral, the size and shape of the effectiveness or

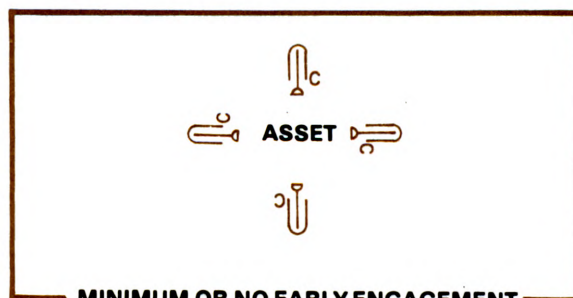
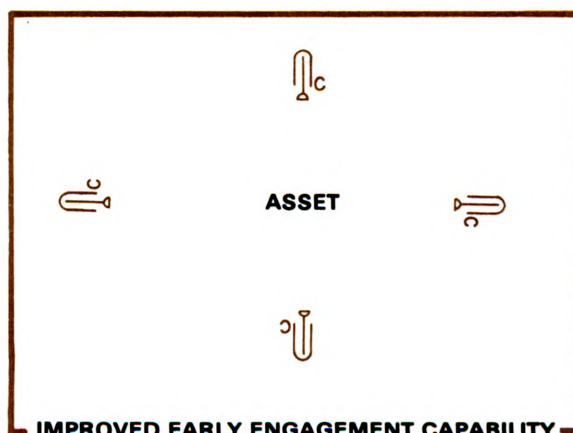
coverage contour is irregular and varies considerably, depending upon such factors as the speed, size, aspect, altitude, and direction of flight of attacking aircraft. Accordingly, mutual support between weapons may be possible when attacks come from certain directions but not from other directions. (See FM 44-1A for classified details.)

REMEMBER

These are general guidelines for use in quickly designing defenses in the field.

EARLY ENGAGEMENT

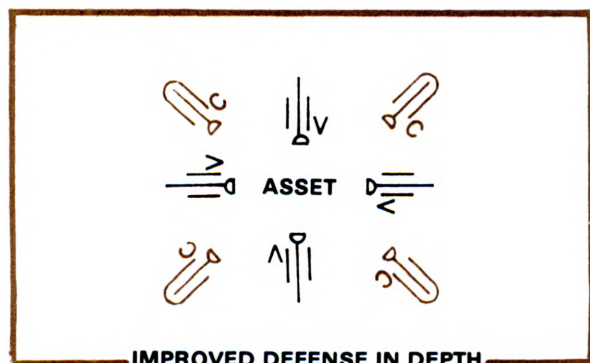
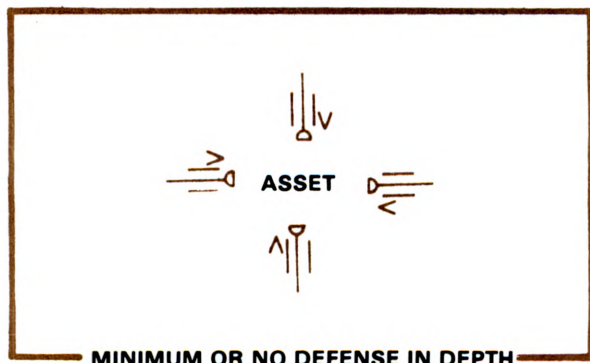
Gain an early engagement capability by positioning some weapons out away from the unit or other asset to be protected. This improves the chances of engaging an aircraft before it attacks the asset.

MINIMUM OR NO EARLY ENGAGEMENT
CAPABILITY

IMPROVED EARLY ENGAGEMENT CAPABILITY

DEFENSE IN DEPTH

Achieve defense in depth by positioning weapons with one generally in front of the other in the direction of attack. This subjects an aircraft attacking the unit or other asset being protected to an ever-increasing volume of massed fires as he approaches his target.



REFERENCE

Guidelines for the employment of Redeye are contained in FM 44-23.

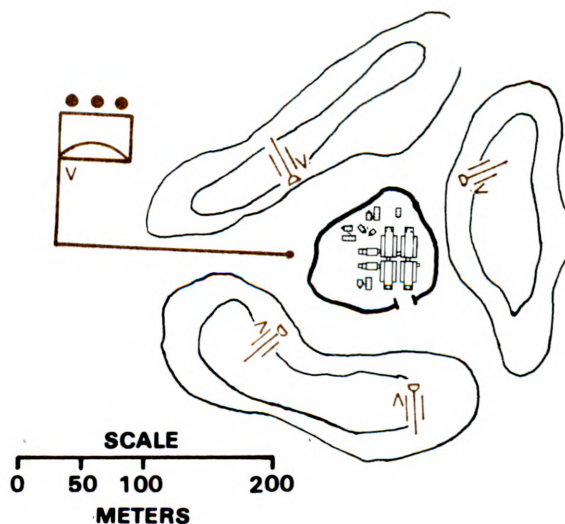
As shown by the examples that follow, **all guidelines will often not be met in designing a defense.** Practical considerations such as the nature of the terrain, which may limit the availability of good firing positions, may preclude compliance with some of the guidelines. Particularly when the number of weapons is small (e.g., in a platoon-size defense)

compliance with one guideline may limit compliance with another. For instance, weapons can be positioned out from the asset only so far for early engagement without losing mutual support between weapons and/or defensive balance. **When all guidelines are not met, a lack of mass is indicated.**

To illustrate the design of stationary asset defenses with different numbers and types of weapons, typical assets which could be accorded air defense priority by corps and division commanders are used as examples.

VULCAN PLATOON

The Vulcan gun is most effective when engaging targets in the head-on (directly incoming) aspect. By positioning weapons on or near the defended asset, aircraft attacking the asset will appear as incoming rather than crossing targets and present a much better target for the Vulcan gunner.



Vulcan Platoon Defense.

■ The four weapons are positioned on or near the asset in good firing positions to enhance Vulcan effectiveness.

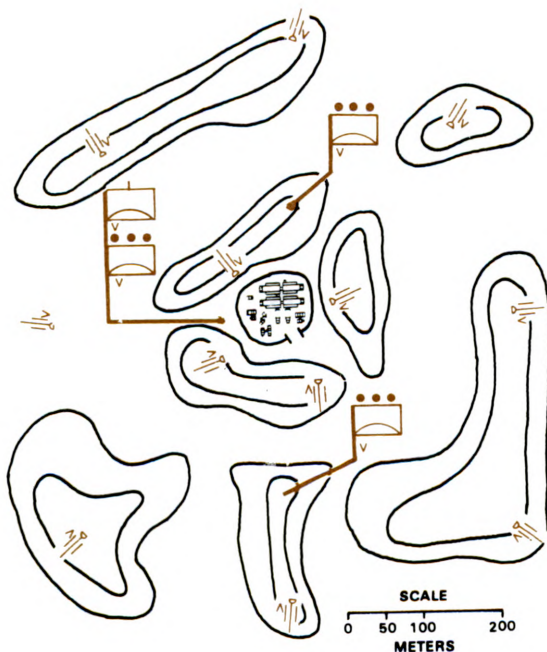
■ Each weapon is located within 1,000 meters of another weapon for mutual support.

■ Weapons are positioned around the asset in a balanced configuration for all-around defense.

With a platoon defense, the early engagement capability is minimal and defense in depth is lacking. This defense may not provide adequate mass to successfully defend the asset, particularly against air attacks by more than one aircraft.

VULCAN BATTERY DEFENSE

In those divisions without Chaparral weapons (e.g., airborne and air assault divisions), a Vulcan battery defense will often be used.



Vulcan Battery Defense.

■ Weapons are placed on or near the asset to enhance Vulcan effectiveness.

■ Each weapon is positioned within 1,000 meters of another weapon for mutual support.

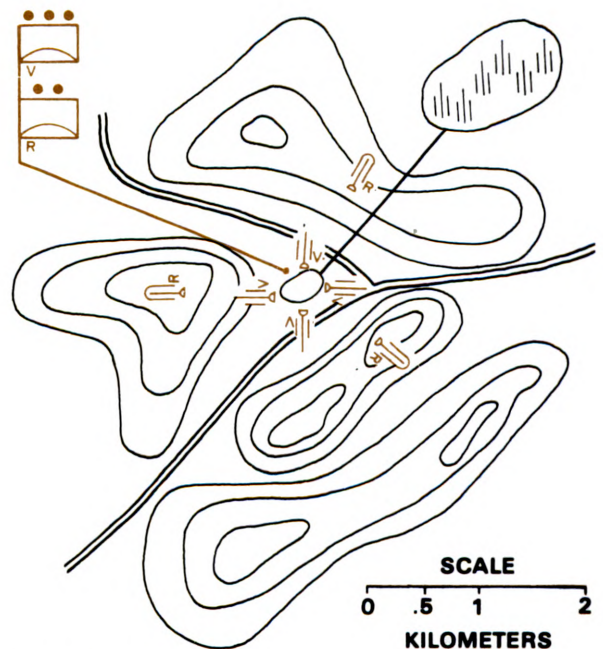
■ Weapons are positioned around the asset in a balanced configuration for all-around defense.

■ Additional weapons are positioned farther out from the asset to provide defense in depth and improve the early engagement capability.

ALL THESE FACTORS CONTRIBUTE MASS TO THE DEFENSE.

VULCAN WITH REDEYE

When Vulcan is defending an asset to which Redeye teams have also been allocated, a mixed gun-missile defense is designed.



Vulcan Platoon and Redeye Section Defense of Field Artillery Battery.

■ The three teams of the field artillery battalion's Redeye section are positioned out from the asset for early engagement and all-around defense with about 2-3 kilometers between the teams so that their fires will overlap.

■ Positioning of the Vulcan platoon's weapons is as previously discussed.

The employment of Redeye with Vulcan increases the early engagement capability and the depth of the defense. An attacker is confronted with two different weapons systems.

CHAPARRAL PLATOON

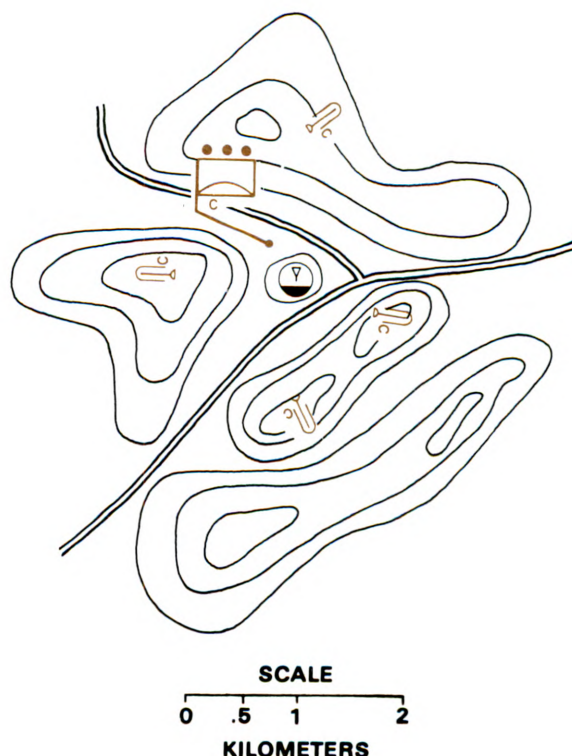
Since all Vulcan weapons will often be committed to the support of maneuver units, a mission for which Chaparral is not well-suited because of its inability to shoot on the move, pure Chaparral defenses of stationary assets will be common.

Chaparral, unlike Vulcan, is most effective against crossing rather than directly incoming targets. Accordingly, Chaparral weapons are positioned farther out from the asset for early engagement of attacking aircraft.

■ Weapons are placed in good firing positions around the asset in a balanced configuration.

■ Weapons are located out from the asset for early engagement.

■ Each weapon is located within 2,000 meters of another weapon for mutual support.



Chaparral Platoon Defense.

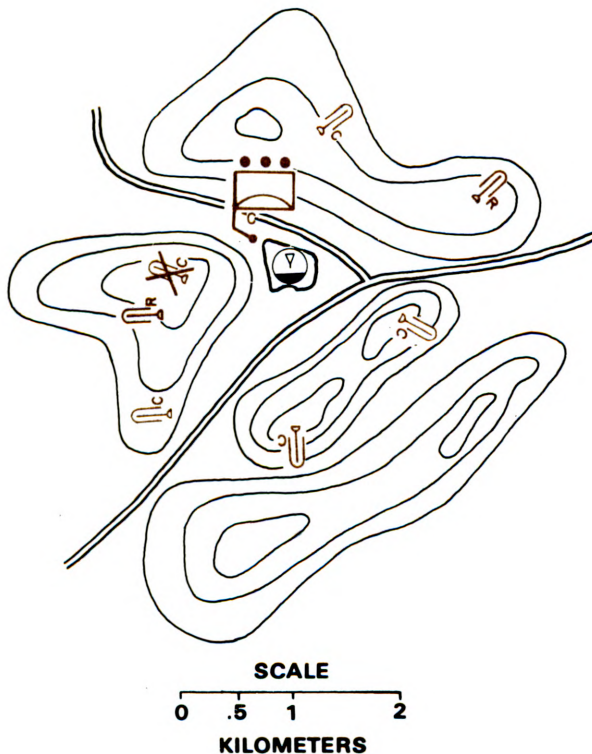
With only one Chaparral platoon, defense in depth is lacking. The early engagement capability and mutual support are marginal. The defense may not provide adequate mass to successfully defend the asset, particularly against attacks by more than one aircraft.

CHAPARRAL WITH REDEYE

The Redeye missiles assigned to Chaparral platoons may be manned by squad personnel and used as required to—

■ Take the place in the defense of a Chaparral weapon that is temporarily out of action for any reason, such as for reloading or repair.

■ Supplement the defense through positioning to enhance mutual support and cover gaps that might otherwise exist in the defense because of terrain limitations in positioning Chaparral (e.g., limited observation and fields of fire in a particular direction).



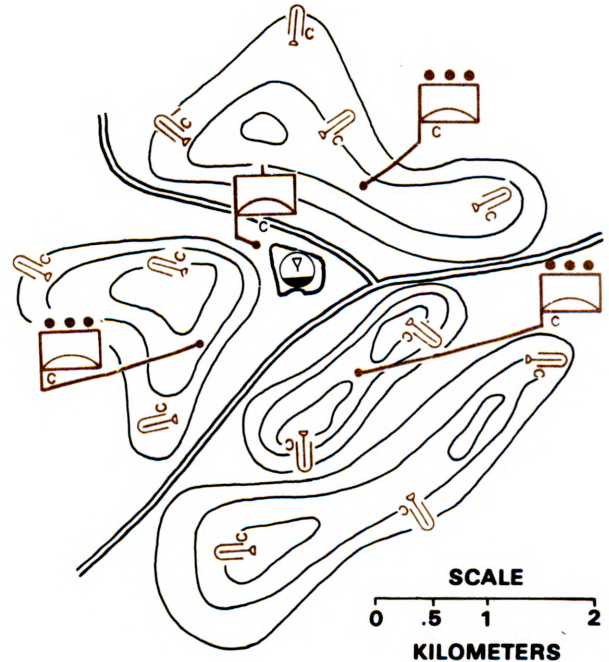
Chaparral Platoon-Use of Redeye.

CHAPARRAL BATTERY DEFENSE

The addition of more weapons to the Chaparral platoon defense provides defense in depth and improves the early engagement and mutual support capabilities of the defense.

As with the Chaparral platoon—

■ Weapons are placed in good firing positions around the asset in a balanced configuration.



Chaparral Battery Defense.

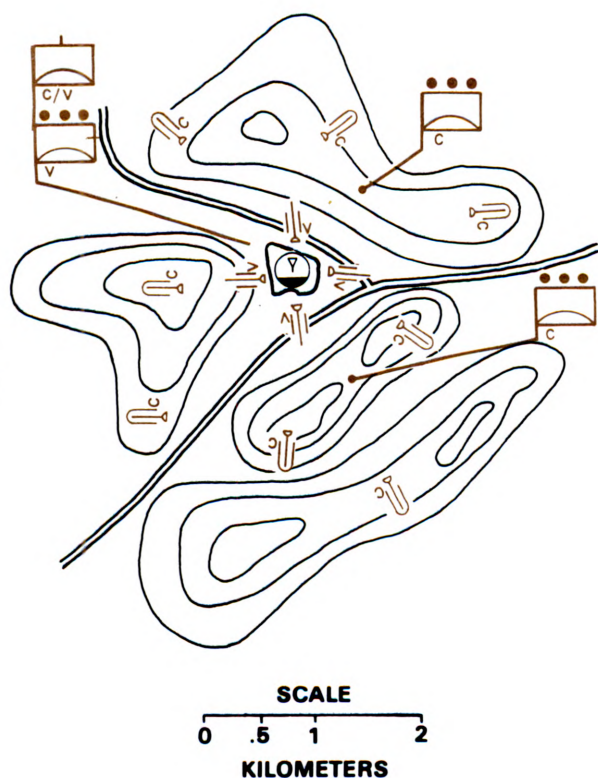
■ Weapons are positioned out from the asset for early engagement.

■ Each weapon is positioned within 2,000 meters of another weapon for mutual support.

CHAPARRAL AND VULCAN MIXED DEFENSE

Whenever the availability of resources permits, a mixed Chaparral/Vulcan defense is established. This subjects an aircraft to the fires of both missiles and guns as it attacks the asset. When designing this mixed weapon defense, weapons are sited in much the same way as previously shown. Each weapon system is positioned to optimize its capabilities against the air threat.

- Vulcan guns are placed on or near the asset.
- Chaparral missiles are located out from the asset.
- Mutual support between like systems is established.
- The defense is balanced.

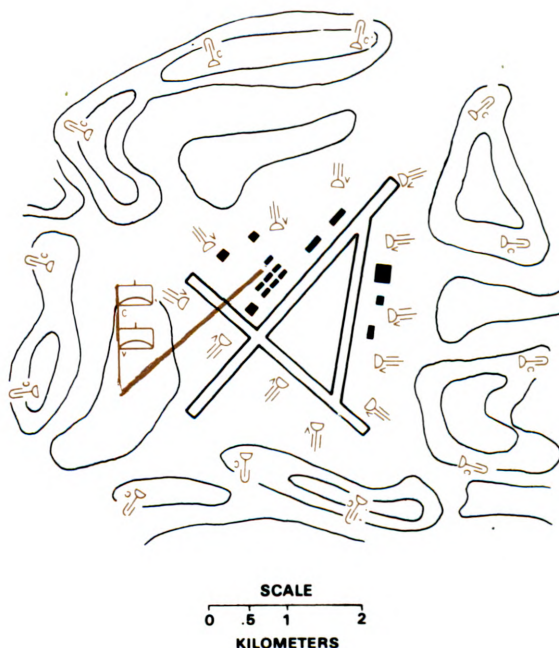


Mixed Chaparral and Vulcan Defense.

A composite battery, consisting of one platoon of Vulcan and two platoons of Chaparral, will usually provide the requisite mass and mix for the defense of most stationary assets to be defended within corps and division areas. Larger assets and/or a very heavy air threat will require additional weapons.

DEFENSE OF A LARGER ASSET

When defending a larger asset, such as an air base or logistical complex in a rear area, the defense design considerations are essentially the same as discussed for those assets of smaller size (i.e., command posts, field artillery batteries, and POL points). More weapons are, of course, required to obtain balance, mutual support, early engagement, and defense in depth, all of which are required for mass.



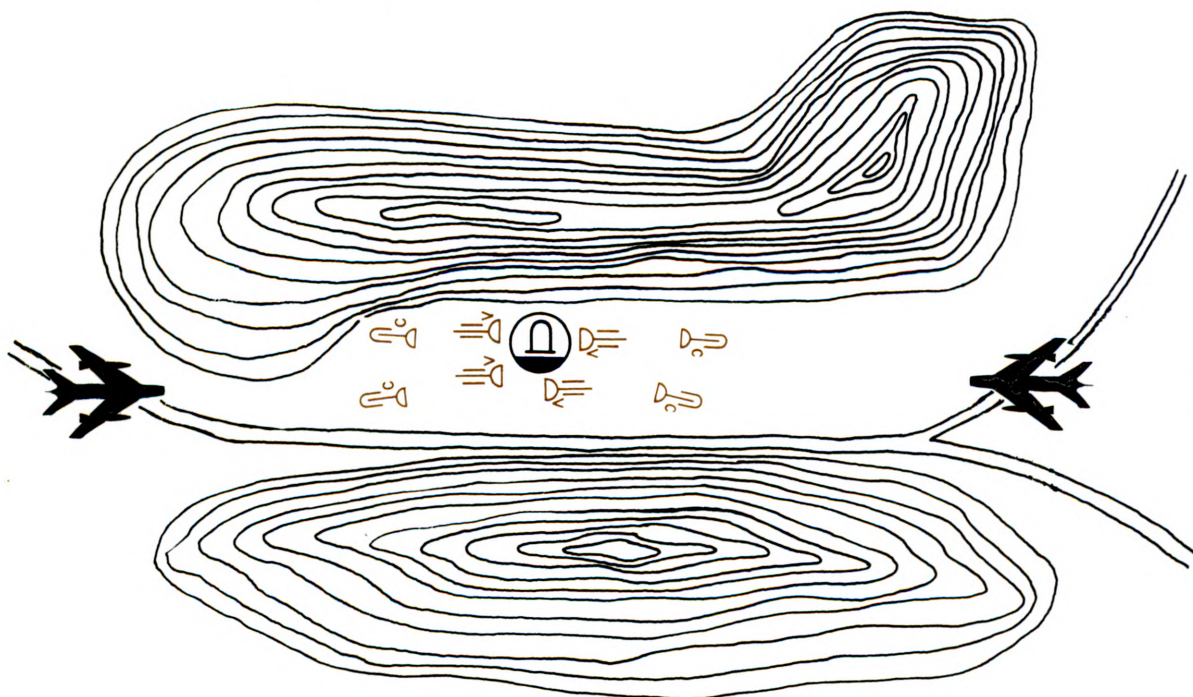
*Defense of a Larger Asset (Airbase)
One Vulcan and One Chaparral Battery.*

- Vulcans are in good firing positions on or near the asset. Each Vulcan is within 1,000 meters of another Vulcan for mutual support.

- Chaparrals are in good firing positions out from the asset for early engagement. Each Chaparral is within 2,000 meters of another Chaparral.
- Both Chaparral and Vulcan are located in a balanced configuration for all-around defense.
- With Vulcan close in and Chaparrals farther out, defense in depth is provided.

WEIGHTED DEFENSE

In unusual circumstances, such as when terrain restricts low-level attack to particular directions or when intelligence has established that air attacks will come from a particular direction, a defense can be weighted.



Weighted Defense.

The same guidelines as previously discussed are used, except that the early engagement capability is oriented toward predicted low-level attack routes and defense in depth is provided along these routes.

In most instances, all-around defense should also be provided, but the defense will not be balanced. Except where attack from certain directions is precluded by terrain, additional weapons are usually required to

provide all-around defense and to also weight the defense.

DEFENSE OF UNITS ON THE MOVE

CONVOYS OR MARCH COLUMNS

Chaparral and Vulcan units will often be required to provide air defense for units while they are moving in convoy or march column along roads behind the line of contact. Units

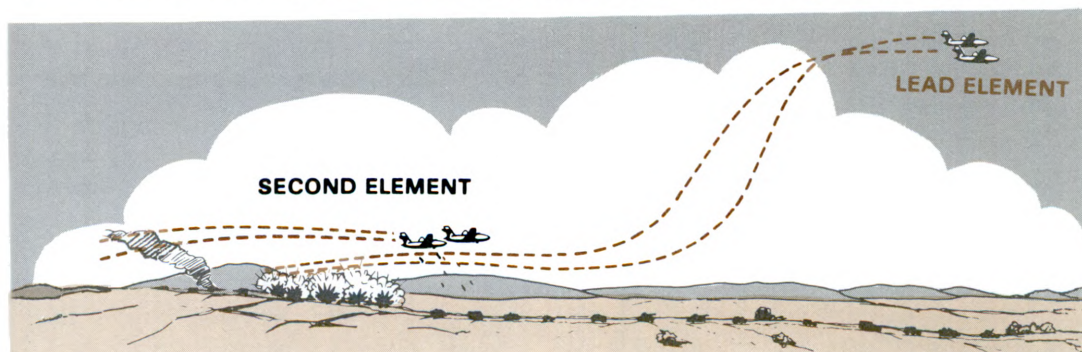
in convoys will usually be moving at a speed of 15-20 mph in either an open column (50-100 meters between vehicles) or closed column (50 meters or less between vehicles). The total length of the convoy will, of course, vary, depending on the spacing of the vehicles and the size of the unit. For example, in closed column a mechanized infantry battalion is about 6 kilometers long and in open column is about 18 kilometers long; a field artillery battery in closed column is approximately $\frac{1}{2}$ kilometer long and in open column approximately 2 kilometers long.

When traveling in convoy under conditions of good visibility, units are very

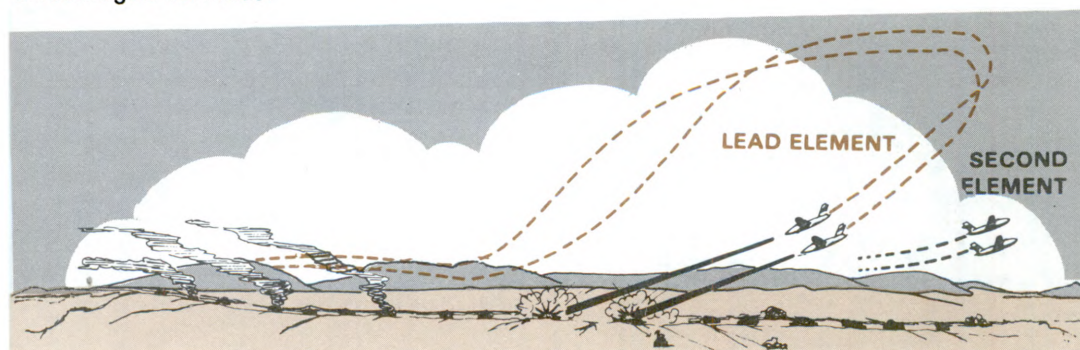
likely targets and are vulnerable to attack by enemy air. As with the defense of units in position behind the line of contact, attack by high-performance aircraft is the primary concern; attack by helicopters is less likely.

March columns are more likely to be attacked as targets of opportunity, rather than as preplanned targets. This means, in essence, that the pilots of enemy aircraft must first find and pinpoint the location of the target before making an attack run. A probable attack scenario, considering a flight of four aircraft armed with various munitions and initially flying low to avoid Hawk radar detection, follows:

Flying in two elements (two aircraft in each element), the lead aircraft spot the convoy and notify the second element. The first element then executes a popup maneuver. This popup is intended to divert attention until the second element attacks with a level, high-speed, low-altitude laydown of cluster bomb units (CBUs) along the length of the convoy.



From the popup, the first element will have completed a reversing maneuver to come back over the column firing rockets or machineguns or dive bombing, concentrating on undamaged vehicles.



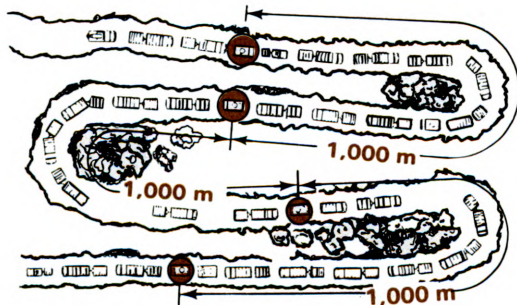
With a flight of only one or two aircraft, the maneuver and attack techniques would be similar to those of the lead element in the above scenario. The aircraft would spot the column, execute a turn, and attack using either the popup or laydown technique.

Vulcan is most effective in convoy defense when integrated into the march column. Integrate Vulcan weapons into a march column by—

First, placing a Vulcan among the first 4 or 5 vehicles, both at the front and rear of the convoy, where air attack may be most likely.

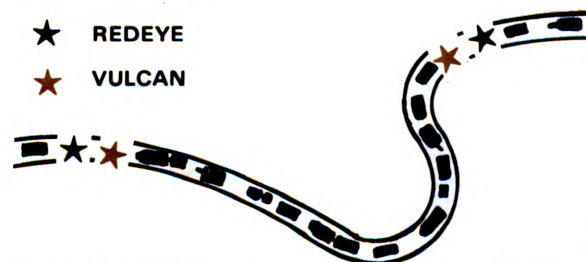
Secondly, start placing one Vulcan about every 1,000 meters working alternately toward the convoy center. More Vulcans, if available, should be added until the separation distance between the two innermost Vulcans is less than 1,000 meters. This order of placement of the Vulcans weights the defense toward the ends of the convoy and provides mutual support between weapons.

The number of Vulcans required is, of course, dependent upon the length of the convoy. For example, for a column of 1,000 meters or less in length, a minimum of two Vulcans is required (avoid employing Vulcan singly); as the column length increases to about 2-3 kilometers, at least three Vulcans are needed and a platoon of four Vulcans should normally be allocated for the defense of the convoy.



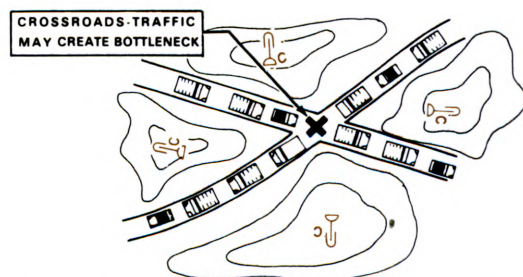
Placement of Vulcans Within a Convoy.

Redeye teams may also be integrated into the march column to assist Vulcan in the defense of the convoy. Redeye teams are positioned—one near the front and one near the rear of the column. If only one team is available, it is placed near the front of the column. If more than two teams are available, they are placed equidistant throughout the rest of the column, less than 3 kilometers apart. Vulcan commanders coordinate with Redeye section and team leaders to integrate the defense of the march column. Redeye teams will, for example, normally operate in the Vulcan platoon net when both are supporting the same unit move.



Vulcan and Redeye Integrated Into March Column.

Since ***Chaparral*** cannot be fired while the carrier is moving, it is ***best employed by prepositioning at critical points along march routes where convoys may be forced to halt or bottleneck.*** Key intersections, bridges and other such points along heavily traveled routes in division, corps, and theater rear areas may be preplanned as targets for enemy air. When establishing a defense of a critical point along a march route, the design is accomplished as previously explained for stationary assets.



Chaparral Supporting Convoys at Critical Point.

When assigned this type mission, the Chaparral unit remains in position as long as the volume of traffic warrants defense of the critical point, then moves on to defend other priority assets as ordered.

MANEUVER FORCES

Maneuver units in the forward area can expect attacks by both high-performance aircraft and helicopters. Although attacks from any direction are possible, attacks from the general direction of the enemy ground forces are most likely. Enemy aircraft will probably approach their targets on routes generally perpendicular to or parallel with the FEBA or LOC. Maneuvering units are more likely to be attacked as targets of opportunity than as preplanned targets. Therefore, jet aircraft attack techniques may be similar to those depicted for the attack of march columns, wherein the aircraft pilot first finds and fixes his target and then attacks.

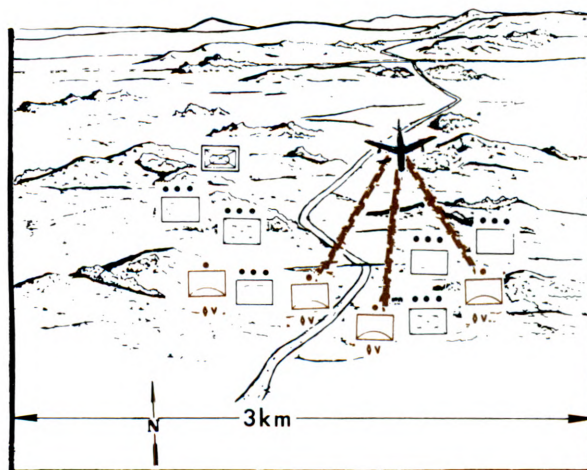
When air defense priority is accorded to maneuver elements, normally only Vulcans will be used to support them. Vulcan's mobility and ability to fire on the move, minimum preparation time, and head-on capability make it the best weapon for defending a moving, exposed maneuver force.

When a significant air threat exists, SP Vulcan normally supports the company team in platoon strength. Because there are not enough Vulcans available to cover the entire force, priority for Vulcan support is to the maneuver units that are critical to the success of the operation (e.g., the units spearheading the attack).

Employment of Vulcan in not less than platoon strength insures massed fires and provides for positive command and control. If employment in less than platoon strength must be resorted to, the number of weapons

employed together should never be less than two and then only if they can be deployed under the direct control of the platoon leader or platoon sergeant.

In determining whether to employ the Vulcan platoon of four weapons with one company or to split the platoon between two companies (two Vulcans with each company), the scheme of maneuver should be analyzed to determine the expected distances between companies. If the distance between adjacent companies is less than 1,000 meters, mutual support between Vulcan sections supporting the separate companies may be possible. With mutual support, one section can deliver fires against aircraft attacking the company supported by the other section. When one Vulcan is temporarily out of action for any reason (e.g., reloading) its position is covered by an adjacent Vulcan and overlapping fires can still be delivered.



Supporting Vulcans move with the company teams and are normally—

Positioned so that two-thirds of the Vulcan's effective air defense range extends forward of the defended force.

Positioned within the maneuver formations so as to defend against air attack along the long axis of the formation.

When the supported force is moving by bounds, Vulcan normally remains with the overwatching element.

Characteristics of overwatch positions selected for maneuver elements generally coincide with the position requirements for Vulcan, including—

- Good observation and fields of fire.
- Protection afforded by covered and concealed positions.
- Immediate and controlled reaction to any air threat (Vulcan in position and ready to fire from a stationary platform).
- Relatively high terrain enhancing line-of-sight communications.

However, *Vulcan may move with the bounding element if—*

A high probability of air attack against the bounding element exists

OR

The bounding element cannot be adequately covered throughout the bound because of Vulcan's range limitations.

When positioning Vulcan with the overwatch or bounding element, the commander should consider the vulnerability of the Vulcan self-propelled vehicle in relation to the tank vehicle. Nevertheless, the mission will be the overriding determinant.

When Vulcan units are supporting maneuver battalions and companies, the Vulcan unit commander will adopt the movement and hiding tactics used by the supported force. The supported commander's maneuver decisions must be followed even if they conflict with Vulcan occupation of good air defense firing positions.

When a Vulcan platoon or section is supporting a company which is also supported by one or more teams from the battalion's Redeye section, ***the supported unit commander will normally delegate to the Vulcan platoon or section leader the authority and responsibility for controlling and positioning Redeye teams*** (see FM 44-23 for details concerning Redeye employment with maneuver elements).

Although air defense is its primary mission, Vulcan can also be used in a ground support role and has an excellent capability to suppress enemy antitank and other crew-served weapons. The decision to employ Vulcan in the ground role must consider the greatest immediate threat to the maneuver force and the availability of ammunition (see appendix C for further information on the use of Vulcan in the ground role).

REFERENCE

Support of maneuver units conducting offensive and defensive operations is covered in more detail in chapters 7 and 8.

POINTS FOR EMPHASIS

As stated at the outset of this chapter, Army air defense assets are few; seldom will the commander have all the air defense weapons he really needs to do the job.

EXAMPLE

In a tank or mechanized infantry division, there are normally a total of about 50 company-size maneuver and field artillery units; a number of important command and control facilities; and many vital logistical support elements. Any of these assets,

as well as others, may be critical to mission accomplishment and vulnerable to air attack.

The division's C/V battalion consists of only 2 Vulcan batteries and 2 Chaparral batteries—a total of 12 platoons consisting of 48 weapon squads.

Chaparral is normally employed by battery or platoon in the defense of stationary assets. This means that *two to six of these type assets can be defended by Chaparral at any one time.*

Vulcan is employed by battery or platoon in the defense of stationary assets or by platoon or section (2 squads) in the defense of maneuver companies. This means that *Vulcan can, at any one time, normally defend either 2 to 6 stationary assets or 6 to 12 company teams or a combination thereof.*

There are simply not enough Chaparral and Vulcan weapons to defend all division assets well. To be effective, Chaparral and Vulcan must be employed in mass and they are most effective when employed together in mixed weapon defenses. Commanders must resist the temptation to spread these air defense weapons too thin, under the guise of “protecting” more assets. This risks both the loss of defended assets and the piecemeal defeat of Chaparral and Vulcan weapons to air attack.

This scarcity of short-range air defense weapons places a high premium on the judicious selection of air defense priorities and the wise allocation of limited resources to their defense. In this connection, commanders should be continually reminded of the basic purpose of short-range weapons

in the overall scheme of air defense artillery employment. Chaparral and Vulcan weapons provide close-in, back-up protection for the commander's high priority assets against attack by enemy aircraft that may get through the low- and medium-altitude area coverage provided by the Hawk missile system.

When employing Chaparral and Vulcan—

Mass

Allocate a sufficient number of weapons to the defense of each priority asset to adequately protect it against the air threat.

Mix

When possible, employ Chaparral and Vulcan weapons together in the defense of priority assets. Use Redeye teams to complement Vulcan defenses when Chaparral is not available. Consider the coverage of the Hawk missile system. Remember the volume of fire that any unit can bring to bear against an attacking aircraft through the judicious use of its organic small arms and machineguns in the air defense role.

Mobility

As priorities dictate, use Vulcan along with Redeye to defend maneuver units; use Chaparral to defend stationary assets and control and support elements that move less frequently.

Integration

Coordinate air defense with maneuver at every echelon receiving air defense artillery support—division, brigade, battalion, and company. Tie divisional air defense in with the overall air defense structure in a theater of operations.



II CHAPTER 7

SUPPORT of OFFENSIVE OPERATIONS

The overall goal of offensive operations is defeat of the enemy's forces or destruction of his will to resist. An attacker seeks a weakness in the enemy defense, concentrates overwhelming combat power against it, and attacks. It may be necessary, first, to weaken the enemy by defensive operations, but decisive results require that the force assume the attack, penetrate or outflank the enemy, and destroy his support, his command and control, and eventually his disorganized combat elements. Offensive operations are conducted for two other major purposes—to secure terrain and to determine enemy strength and dispositions.

This chapter describes how the Chaparral/Vulcan battalion organic to the division supports offensive operations. It includes—

- A brief discussion of the types of offensive operations.
- An overview of how air defense supports offensive operations.
- A portrayal of how Chaparral and Vulcan could be organized for combat and employed in an offensive scenario.
- A description of various movement techniques used within a battalion task force and how air defense supports them.

CONTENTS

	PAGE
Concept and Types of Offensive Operations	7-2
How ADA Supports the Offense	7-3
Organization for Combat—Scenario	7-5
Movement Techniques—How Vulcan Supports	7-8
Vulcan Support of Battalion Task Force—Scenario	7-12

This chapter is not intended to fully educate the reader on the offensive tactics and techniques used

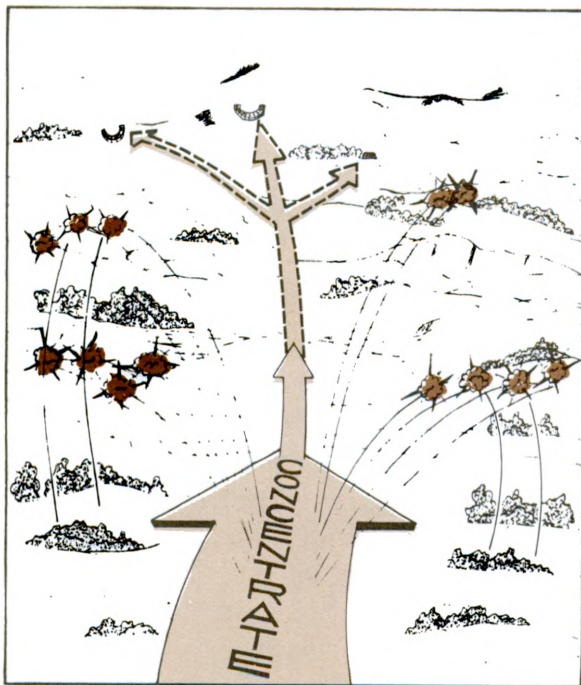
by the maneuver forces. Information of this nature is limited to that required to provide a framework for the discussion of Chaparral and Vulcan employment in support of offensive operations. To insure a comprehensive understanding of all types of offensive operations so they can be effectively supported at all maneuver force levels, platoon, battery, and battalion commanders must study FMs 71-1, 71-2, 71-100, and 71-101.

To effectively support them, the air defense artilleryman must know what the tanker and infantryman are doing at all times and why.

CONCEPT AND TYPES OF OFFENSIVE OPERATIONS

Decisive results are achieved through offensive actions. The attacker seizes the initiative, sets the tempo of battle, and imposes his will on the enemy. The defender is forced to fight and react in places and at times of the attacker's choosing.

The intelligence system provides accurate and timely information of gaps or weak spots in the enemy defenses or determines where the enemy can be weakened. When a weakness is located, *the division exploits its mobility and quickly concentrates overwhelming combat power on a*



narrow front to burst through the enemy's defensive system to destroy forces deep in the rear.

Although the required combat power ratio will vary, the goal is to achieve a ratio of 6:1 or greater at the point of decision. The division commander increases combat power by capitalizing on surprise, security, speed, and deception.

Attacking forces maneuver over covered and concealed routes. Movement is planned to coincide with a well-timed and intense suppression effort. Artillery smoke and high explosives, tactical air strikes, and scatterable mines isolate the critical battle from reinforcement. Maximum violence at the point of concentration is critical.

Once the attack starts, there is no let-up. Enemy strongpoints are bypassed and engaged by follow-on forces. Enemy positions that cannot be bypassed are attacked from the line of march without hesitation. Every effort is made to destroy enemy combat support, combat service support, and command and control facilities.

The *types of offensive* operations commonly conducted *include—*

- **MOVEMENT to CONTACT**
- **ATTACKS—hasty and deliberate**
- **EXPLOITATION**
- **PURSUIT**

A *movement to contact* is conducted to gain or reestablish contact with the enemy. It is used when the enemy situation is vague and the commander is not certain of the enemy dispositions or strengths.

When the force does gain or reestablish contact with the enemy, one of several actions may be taken:

- Part of the force may fix the enemy force with fire while the remainder *bypasses* it.
- The force may conduct a *hasty attack* using fire and maneuver to neutralize or destroy the enemy and continue the attack.
- If strongly defended positions are encountered, the force may stop, regroup, and mass for a *deliberate attack* to penetrate and break through into the enemy's rear area.

An *exploitation* is undertaken to follow up success in the hasty or deliberate attack. This consists of a series of movements to contact and hasty attacks characterized by speed and violence. Pockets of resistance are bypassed to destroy the more vulnerable command and support elements in the enemy's rear area.

Once the enemy is in full retreat, the force executes a *pursuit* to overtake and destroy the retreating forces. Again, pockets of resistance are bypassed as the force moves rapidly to choke off enemy retreat routes.

HOW ADA SUPPORTS THE OFFENSE

Air defense artillery support is essential to the success of offensive operations. When properly employed in support of a division conducting offensive operations, *air defense artillery can—*

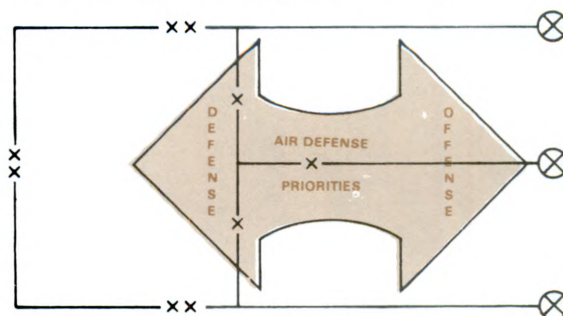
Limit or deny enemy aerial reconnaissance of our forces as the movement to contact, attack, exploitation, and/or pursuit are conducted. If allowed, aerial

reconnaissance provides the enemy valuable intelligence on the disposition and movement of our forces, thus enhancing his capability to successfully defend against us.

Destroy, drive away, or reduce the effectiveness of enemy helicopters and high-performance aircraft attacking our maneuver, combat support, and combat service support elements. Without ADA protection, our attacking forces can be stalled by air attack and can be deprived of their control and supporting means through the loss of command posts and support units to enemy air attack.

Provide third-dimension artillery support for our helicopters and close support aircraft by limiting or denying enemy use of airspace over portions of the battlefield. Without ADA to suppress enemy air, our forces may be deprived of needed aviation and close air support.

*When a maneuver force moves to contact and attacks, it must give up covered and concealed positions which a good defense provides. Without this passive air defense protection, tank and infantry units are vulnerable and make good targets for attack by enemy aircraft. Because of this, within a division, *air defense priorities will normally shift from more rearward critical assets to the exposed battalion task forces making the attack.**

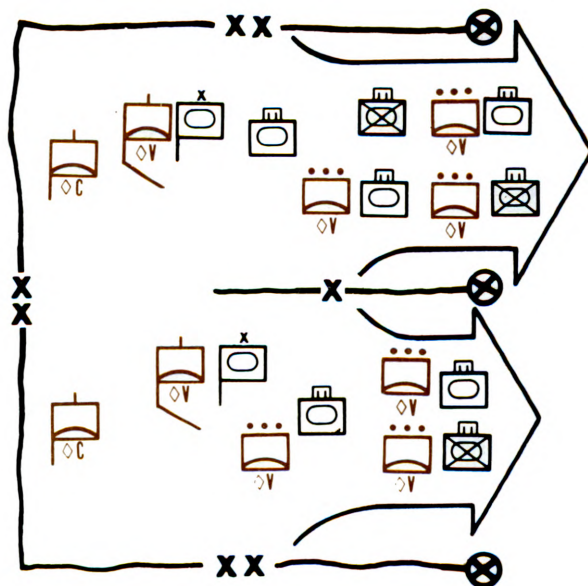


This shift of priorities will affect the employment of each of the type weapons that provide air defense for the division:

Divisional Chaparral/Vulcan battalion units that may have been deployed to protect assets in the brigade and division rear areas in the defense, normally shift their priority forward to the attacking battalion task forces during offensive operations. Although Chaparral continues to support assets in brigade and division rear areas, Vulcan batteries and platoons provide air defense support to brigades and battalions committed to the attack.

A Vulcan platoon supporting a battalion task force will provide air defense of one or two company teams with its four 20-mm cannons. Vulcan guns will normally be positioned and move with attacking tank and infantry platoons to provide

overwatching air defense fires. Their fires will be integrated with those provided by Redeye teams.



Chaparral/Vulcan Support.



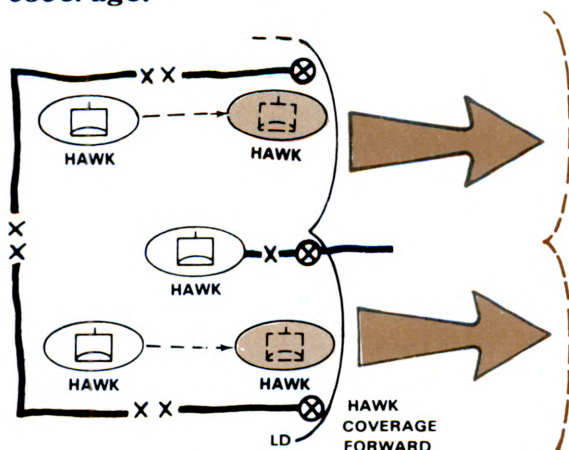
Vulcan and Redeye Fires are Integrated.

Priorities for Redeye support within a battalion task force are also normally shifted forward. Most teams will be dedicated to supporting company teams as they maneuver. Each company team committed in the attack usually receives at least one Redeye team to support it.

REFERENCE

FM 44-23 contains more detailed information on Redeye support of offensive operations.

The DS Hawk battalion supports division offensive operations by providing low- and medium-altitude day and night air defense for the attacking forces. **To insure continuous support is provided, batteries of the Hawk battalion will leapfrog forward keeping advancing battalion task forces under their coverage.**



REFERENCE

More detailed information on Hawk support of offensive operations is contained in FM 44-90.

ORGANIZATION FOR COMBAT-SCENARIO

To illustrate and further explain the organization of a Chaparral/Vulcan

battalion for combat, an example of a mechanized infantry division conducting offensive operations is used. This example shows how a divisional C/V battalion commander developed an ADA organization for combat to support this particular offensive operation.

The division commander's statement of the mission and initial concept was as follows:

MISSION

"The division attacks—and penetrates the enemy's main defensive belt—hold the shoulders of the penetration— assist the passage of the 20th Armored Division— prepare to follow and support them."

CONCEPT

"— attack with two brigades abreast— 1st and 2d Brigades will make the rupture— then widen and hold the shoulders— 3d Brigade will follow in center of the zone and be prepared for commitment in the zone of either brigade."

Based on this mission and concept of the operation, the C/V battalion commander began to develop the priorities for air defense. In so doing, he recognized that he could not possibly protect all the important assets of the division with his limited Chaparral and Vulcan resources. Fortunately, the DS Hawk battalion would be able to provide complete area coverage for the division, allowing C/V to be used to provide close-in protection for the commander's highest priority assets.

After analyzing the scheme of maneuver and discussion with the G3 and other division staff officers, **he visualized the C/V support for the operation generally as follows:**

■ Since the 1st and 2d Brigades will lead the attack and have several battalion-size task forces in a concentrated area, they'll need Vulcan support. Vulcan will initially support maneuver forces of the 1st and 2d Brigades.

■ The division command and control facilities located at the main CP will play an important role in the operation. The main CP does not have the mobility and armor protection of the smaller TAC CP and is relatively vulnerable to air attack. Discussion with the G4 revealed that once the penetration is complete and the division assumes a follow and support mission, POL supply will be critical. Chaparral units will defend assets in the division rear area with priority to the main CP and DISCOM POL point.

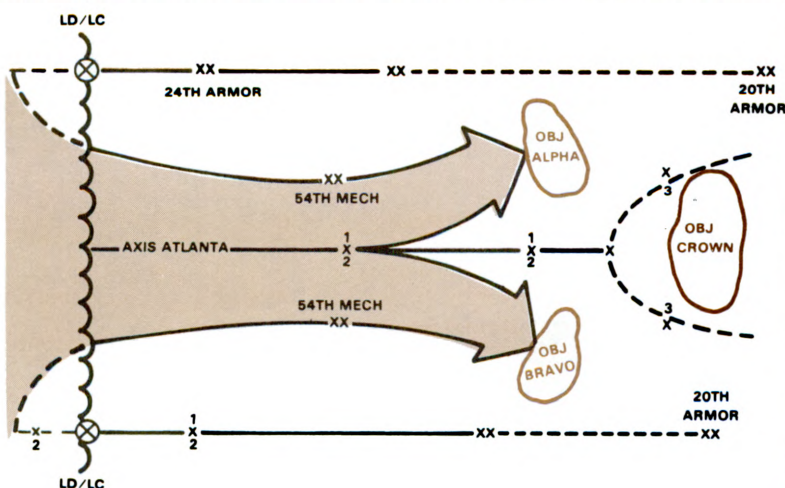
■ When the 3d Brigade shoots through the hole created by the lead brigades and attacks

the enemy in the second echelon, its units will also need Vulcan protection. Contingency plans will be developed to include Vulcan support for the 3d Brigade.

The C/V battalion commander discussed this operation and his concept of ADA support with the Hawk battalion commander. The Hawk battalion commander stated that, as maneuver elements move forward, units of his battalion would displace to provide air defense coverage as far forward of the lead maneuver elements as possible; his units would continue to move forward by battery and platoon echelon as necessary to support the maneuver plan.

After returning from a reconnaissance a few hours later, *the division commander issued a verbal order* which included the following:

The 1st and 2d Brigades, consisting of three battalion task forces each, will attack along axis ATLANTA to secure objectives ALPHA and BRAVO, respectively. The 3d Brigade, made up of five battalion task forces, will attack on order through either the 1st or 2d Brigade to secure objective CROWN. After the 20th Armor passes through, the division will follow and support.



Based on the division commander's earlier initial guidance and subsequent discussion with the G3 and others, the C/V battalion commander had anticipated the order virtually as announced.

Working with his S3 and DAME operations officer, he *had already developed the following air defense priorities and allocation of resources to support the operation:*

PRIORITY	ASSET	RESOURCE
1	1st Brigade— Maneuver battalions	1 Vulcan battery (3 platoons)
2	2d Brigade— Maneuver battalions	1 Vulcan battery (3 platoons)
3	DISCOM POL point	1 Chaparral battery (3 platoons)
4	Division main CP	1 Chaparral battery (3 platoons)

When committed, 3d Brigade will be accorded first priority and will be supported by 3 Vulcan platoons to be taken from 1st Brigade. (As compared with objective BRAVO, the terrain in and around objective ALPHA appears to offer better concealment from the air. 1st Brigade should be less vulnerable to air attack than 2d Brigade.)

These recommended priorities, along with the proposed allocation of resources, were, after some discussion, approved by the division commander.

The division commander was also briefed on and approved the Hawk battalion commander's plan for support of the operation.

C/V TASK ORGANIZATION			
UNIT	ORGANIZATION	MISSION	PRIORITY
Battery A	3 Vulcan plt	DS 1st Bde o/o DS 3d Bde	Attack battalions Attack battalions
Battery B	3 Vulcan plt	DS 2d Bde	Attack battalions
Battery C	3 Chaparral Plt	GS	DISCOM POL point
Battery D	3 Chaparral plt	GS	Division main CP

After considering the current disposition and the readiness posture of each of his batteries, ***the task organization, as depicted above, was finalized*** for inclusion in the division operations order.

Based on the recommendations of the FAAR platoon leader and the S3, ***the***

battalion commander decided to retain all FAARs under battalion control, at least initially. This way, they can be positioned to provide better coverage for the battalion as a whole and for Redeye teams. He instructed the S3 to be prepared to place 2 FAARs OPCON to Battery A when the battery is ordered to support 3d Brigade.

Upon first learning of the operation and developing his concept for supporting it, *the C/V battalion commander had alerted his battery commanders and informed them of their probable employment to allow them maximum preparation time.* Through his air defense coordination officers at the brigade CPs, he had determined that the 1st and 2d Brigade commanders would further allocate one Vulcan platoon to each battalion task force. The C/V battalion TOC will now issue the necessary orders to all batteries to implement the plan.

Battery commanders and platoon leaders must establish a close relationship with any unit they are defending. This is particularly important when supporting maneuver elements—

■ The battery commander establishes contact with the brigade commander. He uses his platoons to defend battalions specified by the brigade commander. As the battle progresses, the battery commander responds to any changes in priorities made by the brigade commander and shifts his platoons as necessary to accommodate them.

■ Similarly, the platoon leader establishes and maintains contact with the commander of the unit he is supporting. At the supported battalion TOC, he coordinates with the Redeye section leader to integrate and coordinate the use of Vulcans and Redeye. He determines which company his platoon is to support and establishes and maintains close contact with this company commander. When his platoon is supporting two companies with two Vulcans each, he maintains contact with one company commander and his platoon sergeant maintains contact with the other.

MOVEMENT TECHNIQUES—HOW VULCAN SUPPORTS

GENERAL

Since movement is an important part of any offensive operation, *the techniques used to maneuver a battalion task force and its elements are key to mission accomplishment.* This becomes especially important when conducting a movement to contact since this type of offensive action takes place as the first step of an attack or as a part of other operations such as an exploitation or pursuit. Once contact is made, fire and maneuver is the immediate action for a task force or maneuver company. Fire and maneuver normally follow the movement techniques used in the movement to contact.

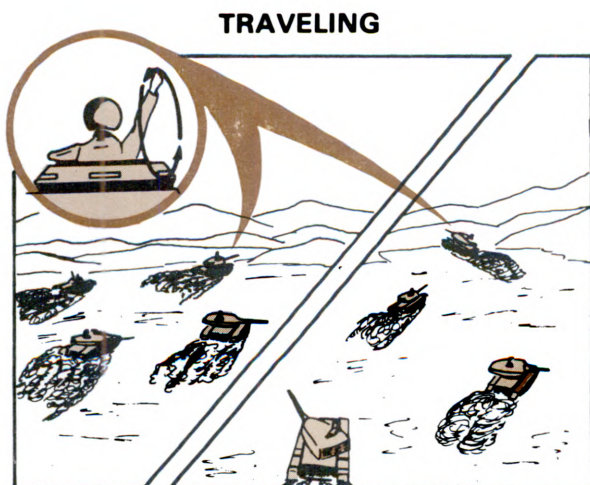
The battalion task force usually moves to contact with at least two companies leading on generally parallel axes, while the company moves on a single column axis. Movement techniques are based on terrain and the likelihood of enemy contact—

LIKELIHOOD OF CONTACT	MOVEMENT TECHNIQUE
NOT LIKELY	TRAVELING
POSSIBLE	TRAVELING OVERWATCH
EXPECTED	BOUNDING OVERWATCH

Battlefield movement techniques are designed to minimize exposure of the unit to enemy fire and place the unit in a good posture to react to enemy contact. However, movement techniques alone are not enough. Each vehicle crew must make maximum use of all available natural cover and concealment when moving or in overwatch.

Since Vulcan platoons are normally allocated to support battalion task forces as they move to contact or attack by fire and maneuver, **platoon leaders must be familiar with these movement techniques and how they can best provide defense against air attack.** In supporting any of these movement techniques, Vulcan platoon leaders should **adhere to the following guidelines:**

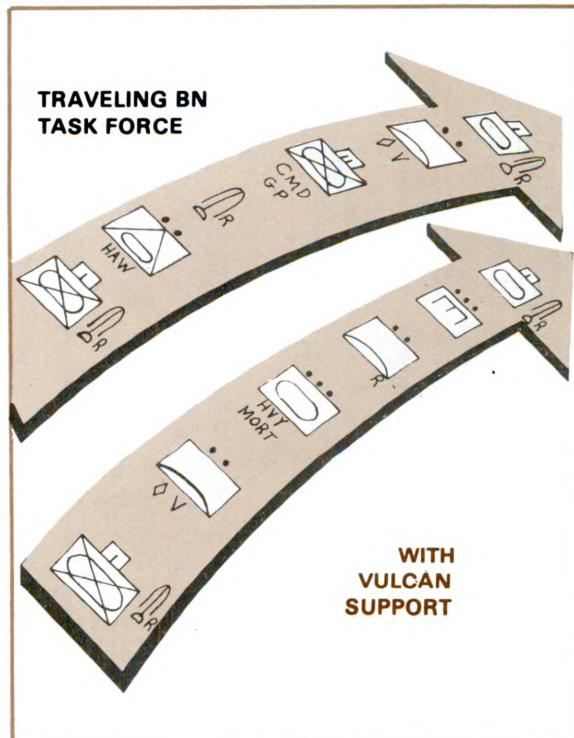
- Deploy Vulcans at least in pairs to provide mutual support.
- Coordinate placement of Redeye.
- Use movement tactics of the supported unit.
- Locate Vulcans behind moving elements.
- Provide air defense coverage forward of the lead elements.
- Do not interfere with maneuver of the supported unit.
- Stay near the commander.



Traveling is used when speed is necessary and contact with the enemy is not likely. The unit moves with an interval

between elements based on visibility, terrain, and range of weapons.

A battalion task force can be composed of various elements and, when using the traveling technique, can be configured to move in one or more columns. Considerations in positioning Vulcan and Redeye are basically the same, regardless of the task force composition and configuration. A Vulcan platoon supporting a battalion task force consisting of four company teams and traveling in two columns positions a section (two Vulcans) behind the lead company in one column and a section to the rear preceding the last company in the adjacent column. This positioning affords air defense coverage forward of the lead elements as well as providing other elements of the column defense against air attack. Redeye teams will be positioned at the front and rear of both columns with the remaining team positioned centrally within one of the columns.



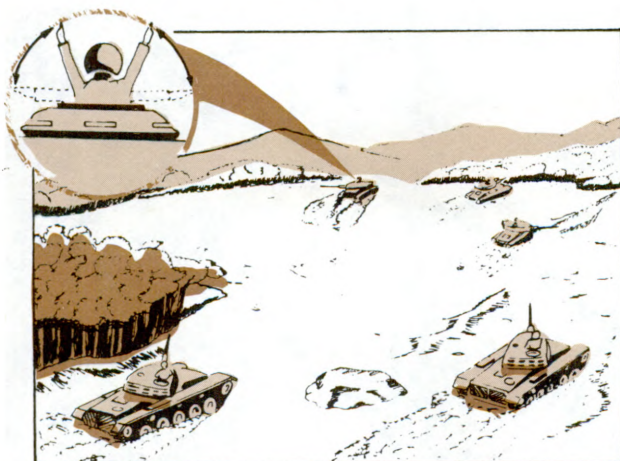
When a Vulcan platoon supports a company team using the traveling technique, a section of Vulcans is positioned behind the lead platoon and a section preceding the trail platoon. If the company is supported by one Redeye team, it would be positioned with the most critical element of the company. With two Redeye teams, their positions would be near the front and rear of the column.



overwatch is characterized by continuous movement of the lead element. The trailing element moves at variable speeds and may even pause to overwatch the movement of the lead element. The trailing element keys its movement to terrain, always guided by the principle of **overwatch**. It overwatches at a distance such that enemy engagement of the lead element will not prevent the trailing element from placing suppressive fires on the enemy, or maneuvering to support the lead element.

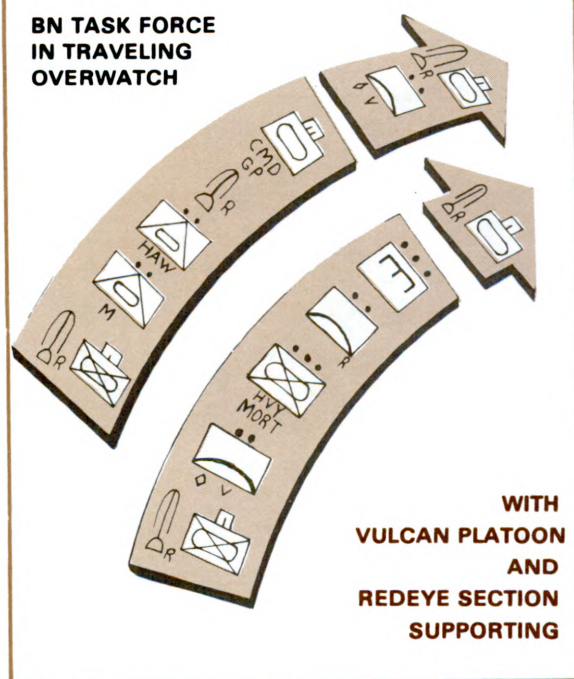
When a Vulcan platoon is allocated to a battalion task force conducting traveling overwatch, one section should be positioned behind the lead element in one column and the other section should be positioned preceding the trail element in the adjacent column. Redeye teams would be positioned forward with the lead element and to the rear of the overwatch element with the remaining team positioned centrally within one of the columns.

TRAVELING OVERWATCH

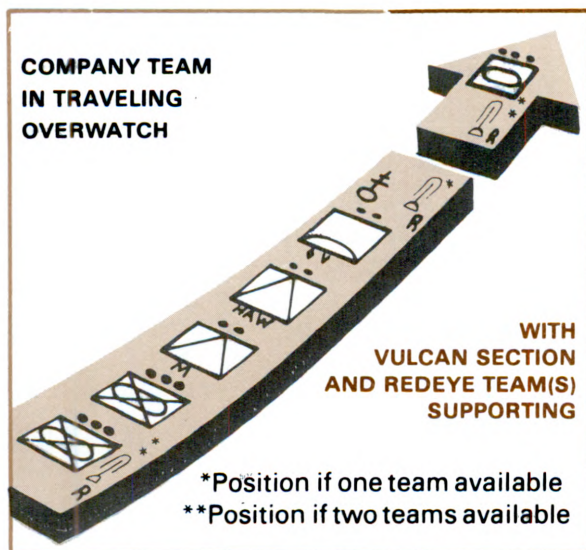


When enemy contact is possible, but speed and movement in mass are desirable, the unit uses the traveling overwatch technique. Traveling

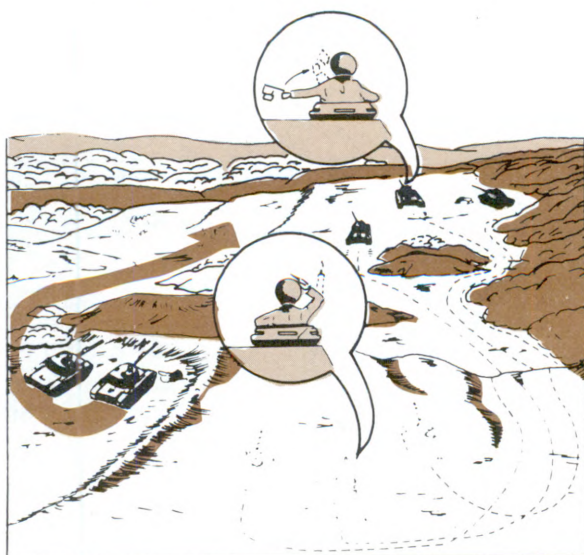
BN TASK FORCE IN TRAVELING OVERWATCH



If one section is supporting a company team conducting this movement, its position would be forward in the overwatch element. This position affords coverage forward of the lead element. When two Redeye teams are available, one team should be with the lead element and the other team should remain in the rear of the overwatch element. If one team is supporting, it remains forward in the overwatch element.

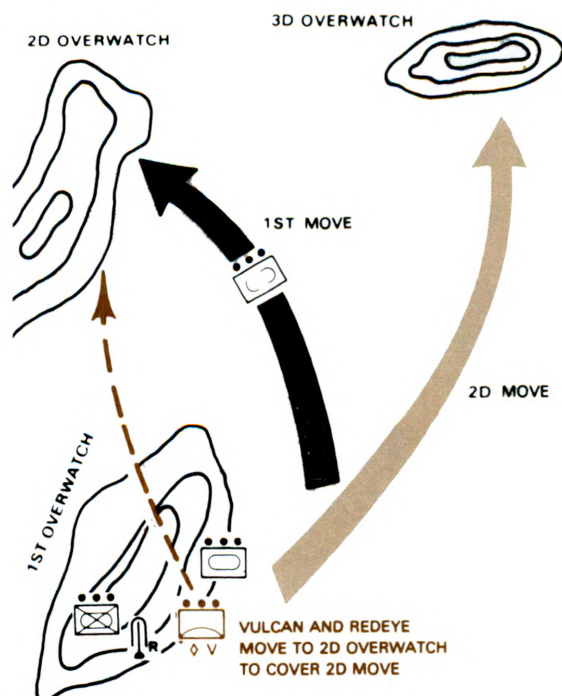


BOUNDING OVERWATCH



When enemy contact is expected, the unit employs bounding overwatch. Elements move by bounds, one covering or overwatching the move of the other. One element is always in position to overwatch with suppressive fires before the other moves. The advancing element moves forward on a covered route whenever one is available. The overwatching element is positioned to support the moving element by suppressive fire or by fire and maneuver. Visual contact between elements is always maintained.

Air defense coverage is normally provided from the overwatch position. Vulcans are positioned within the overwatch element's position but must maintain coverage forward of the bounding element's next position. If Redeye is also supporting this movement, it also provides coverage from the overwatch position. When the bounding element takes up the overwatch, Vulcan and Redeye move to the new overwatch position.

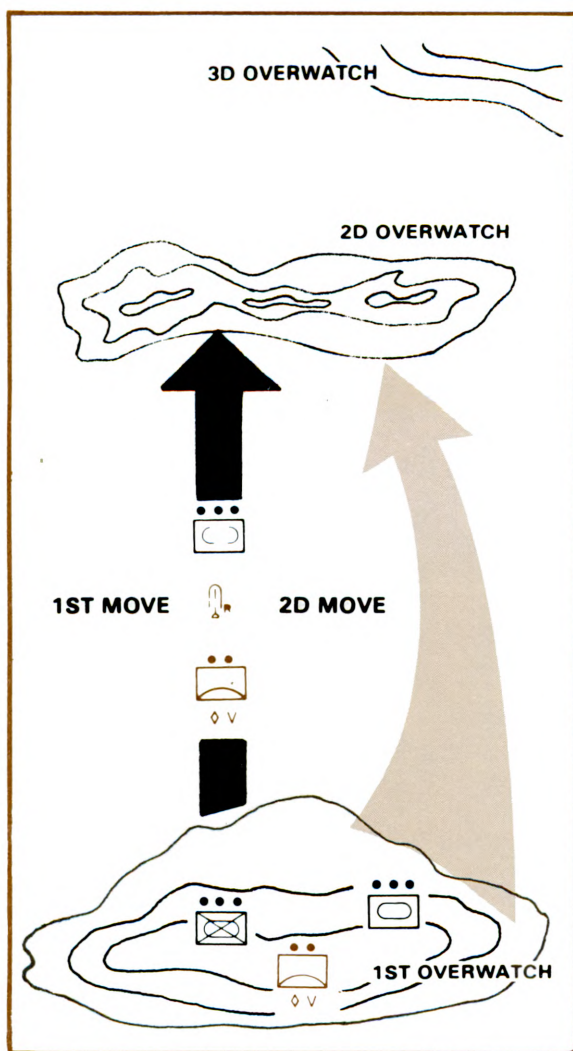


A Vulcan section may accompany the bounding element if:

A high probability of air attack against the bounding element exists

OR

Coverage cannot be maintained from the overwatch position because of terrain interference or Vulcan's range limitations.



Vulcan and Redeye with Bounding Element.

REMEMBER

BEFORE THE COMMANDER ELECTS TO PLACE VULCAN WITH THE BOUNDING ELEMENT, HE SHOULD CONSIDER THE HIGH RISK INVOLVED AND THE FACT THAT VULCAN ASSETS ARE FEW AND, IF LOST, ARE DIFFICULT TO REPLACE.

FIRE AND MANEUVER

When contact is gained, fire and maneuver may be used. Movement is similar to bounding overwatch, coupled with controlled and directed fires against the enemy position. The same basic guidelines for Vulcan and Redeye supporting the bounding overwatch also apply when supporting units using other forms of maneuver during an attack.

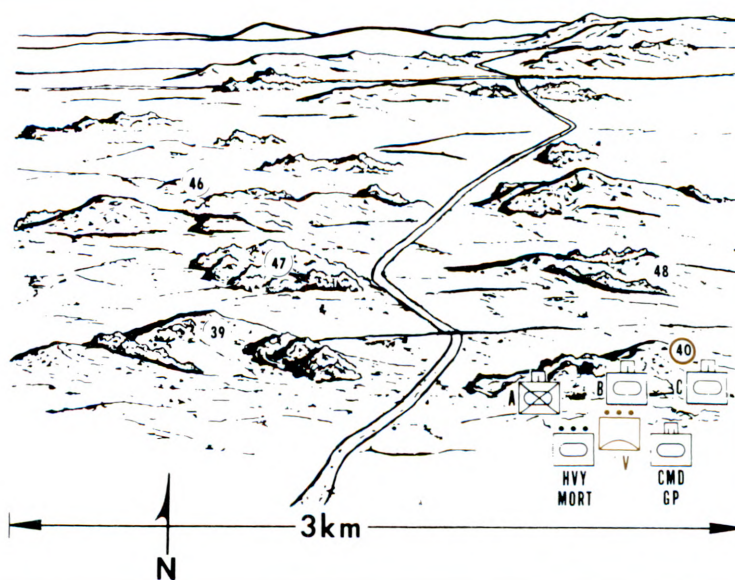
VULCAN SUPPORT OF BATTALION TASK FORCE—SCENARIO

GENERAL

This scenario portrays the support provided by a Vulcan platoon allocated to a tank-heavy battalion task force conducting a hasty attack. In this example, discussion of Redeye teams is also included to illustrate how the Vulcan platoon leader coordinates with the Redeye team chief to provide an integrated defense. Although the hasty attack is only one of several types of offensive operations, its use demonstrates how most of the Vulcan employment principles and guidelines discussed previously could be applied.

SITUATION

In this situation, the battalion task force has destroyed an enemy unit on the hill at checkpoint 40 and is ready to continue the attack to the north. A hostile air threat to the forward maneuver element exists. Enemy antitank helicopters have destroyed many armored vehicles over the past 10 days. The division commander has assigned priority for air defense to the forward maneuver elements. A Vulcan platoon is supporting the task force during this operation.

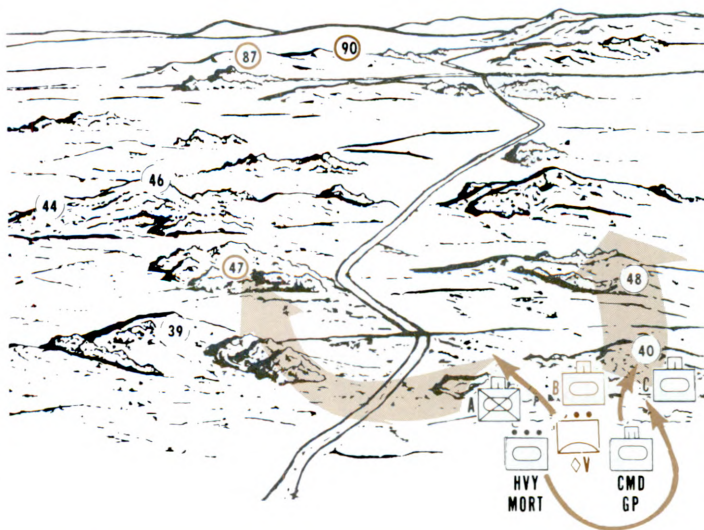


The Vulcan platoon is supporting Team B, as the task force commander considers this team as most critical to the success of the operation. The Vulcan platoon leader coordinates with the Redeye section leader. The Redeye team designated to accompany Team B will establish communications in the

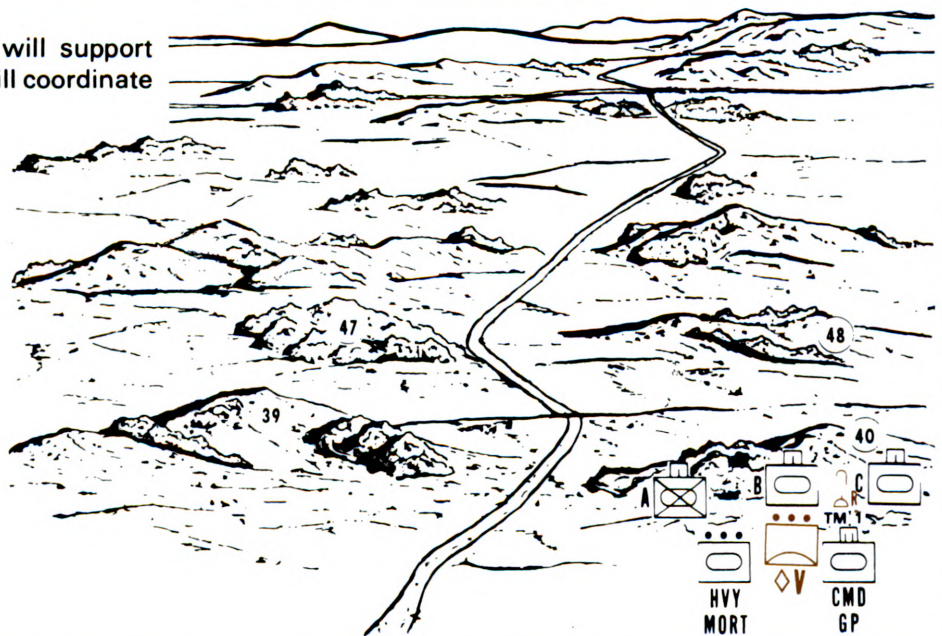
Vulcan platoon command net. Positioning orders from the Team B commander and air defense fire control information from his section headquarters will be relayed through the Vulcan platoon leader on this net.

The Vulcan platoon leader now briefs his personnel as follows:

"I have just received the battalion commander's orders. First of all, the enemy situation—we can expect Su-7s, Su-20s, and MiG-23s to attack the company teams as they advance. They will try to knock out our armor and mech infantry. We may also expect some ATGM helicopters which will probably use these long ridges as a mask (CPs 87 and 90). Again, the target will be our armor. The friendly situation is as follows: Team B attacks to secure checkpoint (CP 47). Our platoon of SP Vulcans will support it. The balance of the task force, with Team C leading, moves north, followed by the command group and Team A."



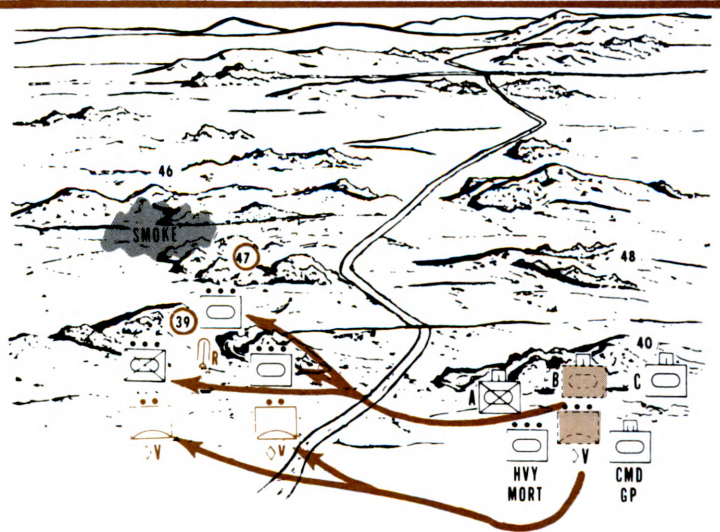
"Redeye Team 1 will support Team Bravo and will coordinate with us."



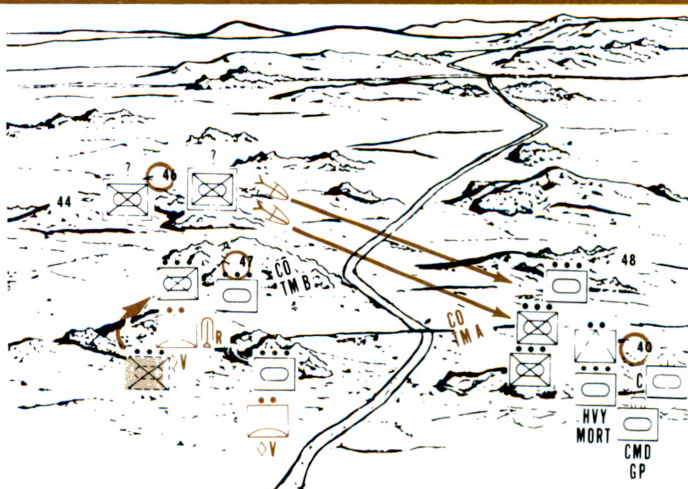
"Weapons control status is WEAPONS TIGHT but may change to WEAPONS HOLD if our own close air support is called in or if there are friendly flights in progress. The 2d section of the battalion's FAAR platoon will provide alert warning. The radar will be positioned on this hill at coordinates GR108570. The RFDL frequency is 38.5 and

the address code is 6. Mark your route on the TADDS so you can correlate your position with the FAAR. Initially, the platoons will move using the overwatch techniques. Remember, the platoon call sign is 'A2L' and the frequency is 36.40. The other call signs and frequencies are in your CEOI. Be sure you have rations and water for 1 day."

Team B moved into position and established an overwatch element with two platoons at CP 39, while a tank platoon prepared to bound to CP 47. Mortars placed smoke near CP 47 to screen the move of Team B's bounding platoon. The Vulcan platoon and Redeye team moved to the overwatch position and provided air defense for the bounding tank platoon.

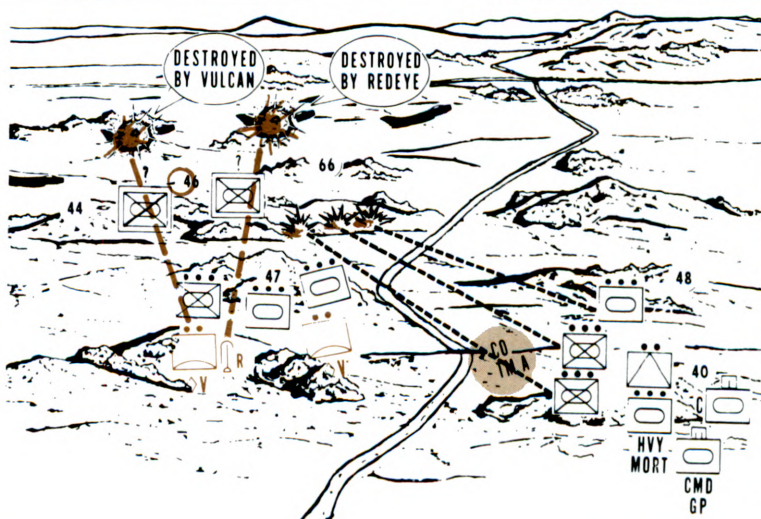


Team B's leading platoon made it to the woodline at CP 47, and the mechanized infantry platoon joined. The second tank platoon prepared to move to CP 47. The Vulcan sections accompanying the company teams adopted the movement techniques of the supported unit and positioned themselves to provide air defense coverage forward of the lead elements. Team A, overwatching from the west end of CP 40, was engaged with missiles from enemy positions in the vicinity of CP 46.



Team A commander returned fire, called for field artillery fire near CP 46, and reported to the battalion task force commander.

Team B commander reported CP 47 occupied and that he could see the enemy at CP 46. A flight of Su-7s attacked in the vicinity of CP 47 and the Vulcans and Redeye engaged the aircraft and destroyed two of them.



The battalion task force commander issued the following FRAGO:

"Enemy located vicinity CP 46.

"Teams B and C will attack to clear enemy positions in vicinity of CP 46, Team B on the left, Team C on the right. Mortars fire smoke between CPs 66 and 47. Artillery, continue fire on enemy.

"Team B, move on an axis of CP 47 through CP 44 to attack toward CP 46.

"Team C, follow command group to CP 47, move up on right of Team B to attack CP 46.

"Team A, guard right flank, continue to suppress CP 46 from present position.

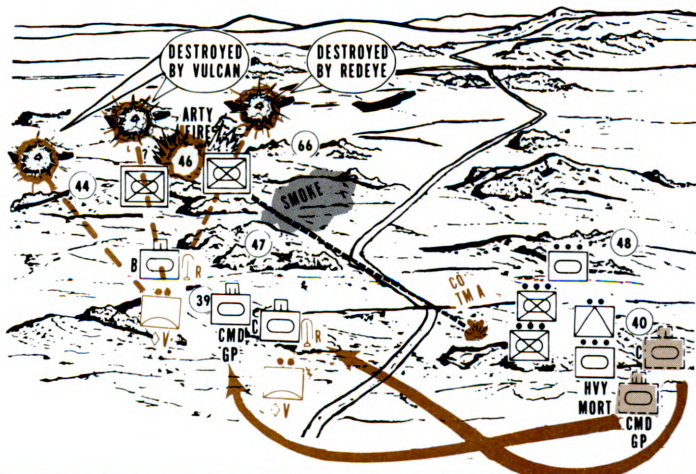
"Vulcan platoon, one section support Team B and one section support Team C.

"I will follow Team B as far as CP 47, then follow Teams B and C in the attack to control maneuver. MOVE OUT!"

The Vulcan platoon leader sent his platoon sergeant with one Vulcan section to support Team C. The platoon sergeant coordinated with the Redeye team to provide an integrated air defense for the company.

As Teams B and C moved toward CP 46, the Vulcan platoon leader received early warning information from the Chaparral/Vulcan battalion CP that a flight of four aircraft was proceeding toward the area of operations. ID was unknown. The platoon leader passed this on to the battalion and all units were alerted. The squad leader of the 1st Squad was the first to detect the incoming aircraft. Both the gunner and squad leader identified the aircraft as Su-7s and the gunner prepared to engage the targets.

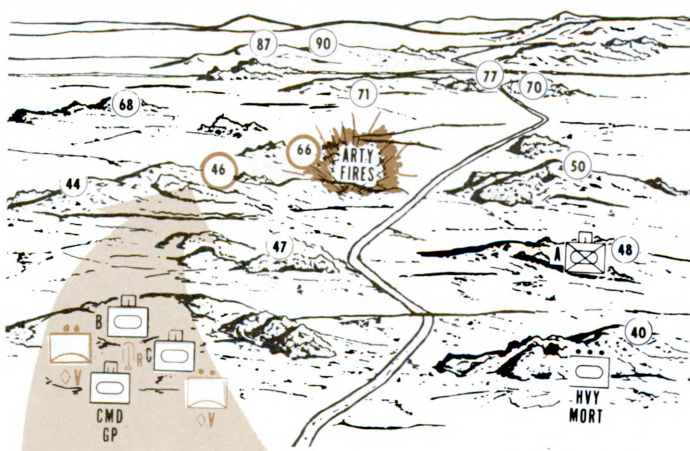
As soon as the aircraft were in range, they were engaged and two aircraft were destroyed. A third aircraft was destroyed by the Redeye team. The remaining aircraft escaped to the north.



Teams B and C assaulted and overran the enemy position at CP 46.

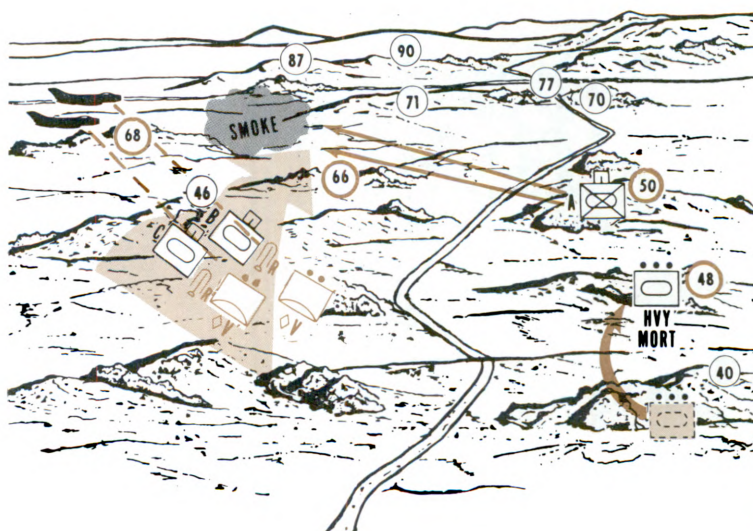
The battalion task force commander prepared to continue the attack. Supporting field artillery fire continued in the area of CP 66.

The Vulcan platoon leader continued to support Team B with one section while his platoon sergeant was directing the section supporting Team C.

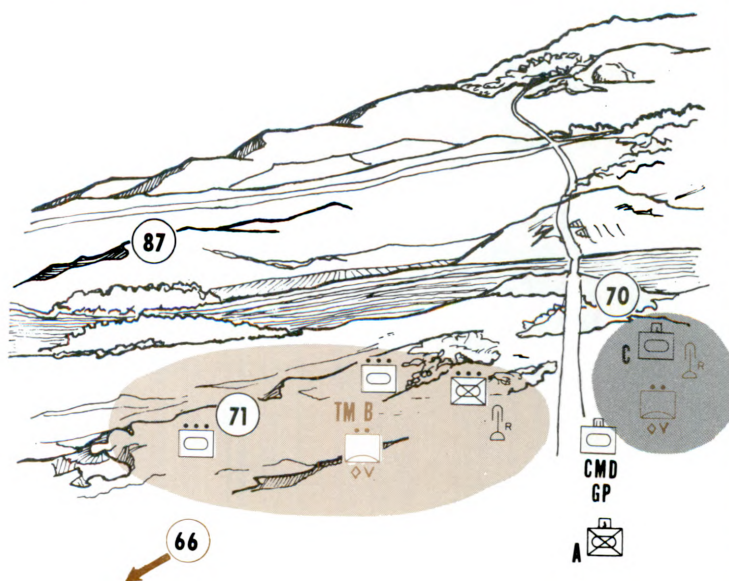


Team A advanced to CP 50. Teams B and C overwatched the move. Mortars of Team A placed smoke in the saddle between CP 66 and CP 68. The heavy mortar platoon displaced to CP 48.

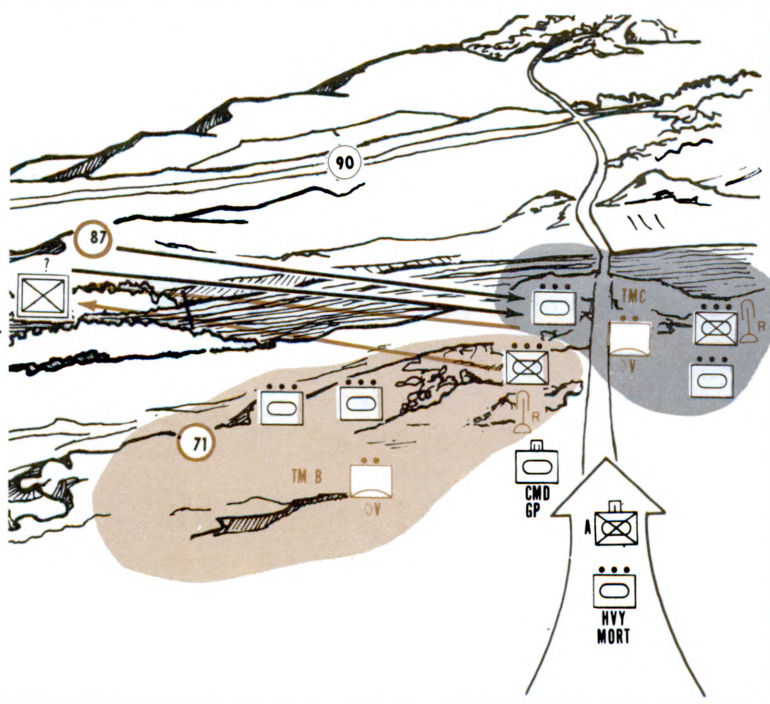
The task force commander ordered Team A to suppress from CP 50 toward CP 66 with Teams B and C attacking. Again, enemy aircraft attempted to prevent Teams B and C from attacking. Fires from the Vulcan section and Redeye teams drove the aircraft off, preventing the aircraft from suppressing the attack; however, this time no aircraft were destroyed.



The battalion task force destroyed an enemy mortar position at CP 66 and continued its advance. Team B was on the left supported by one Vulcan section and Redeye team while Team C was on the right supported by the other Vulcan section and a Redeye team. Team A followed Team C.



Team B overwatched the movement of Team C from CP 71. Team C was bounding toward the bridge and received fire from across the river. Team C commander returned the fire, assessed the situation, sought cover, and reported. An enemy infantry element of unknown size was spotted in the vicinity of CP 87.



The TF commander decided to attack on the axis CPs 71, 87, and 90. In this situation, he:

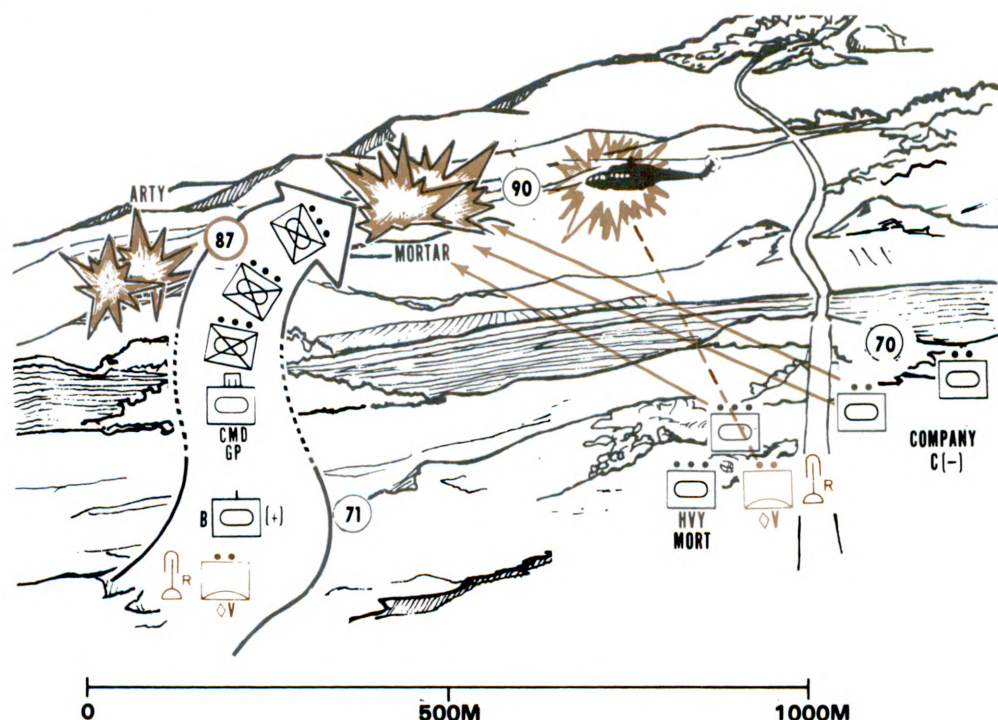
- Requested field artillery fire on the enemy infantry at CP 87.
- Ordered Team C to detach its mechanized infantry platoon to Team A and AVLB to Team B.
- Ordered Team A to detach its tank platoon to Team B, receive attachment of all mech infantry platoons, attack toward CP 87.

- Ordered Team B to detach its mech platoon to Team A, receive attachment of A's tank platoon and C's AVLB, follow Team A (now Company A) across the river to enemy positions. Suppress for Company A during the crossing.
- Ordered the Vulcan platoon leader to support Company C(-) in the overwatch position with one section, and Company B(+) with the other section.

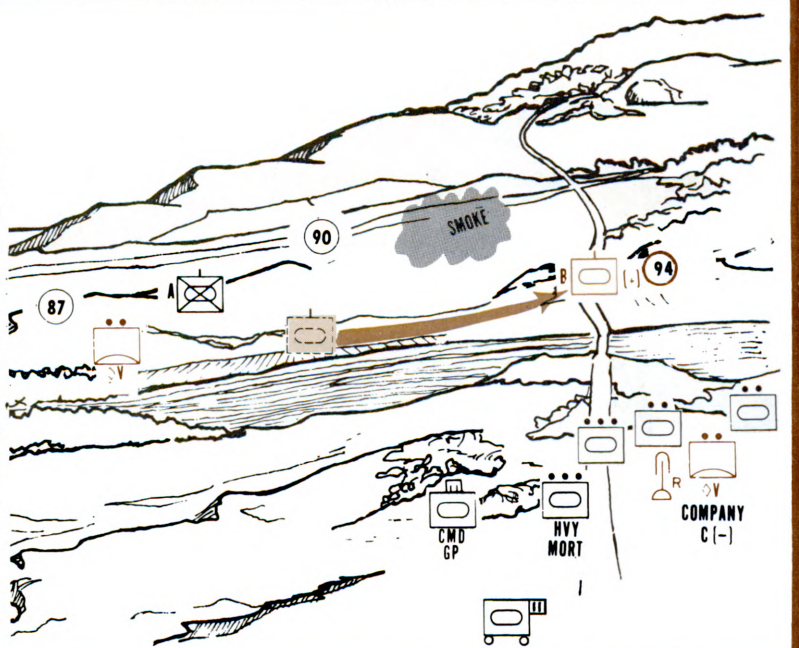
The Vulcan platoon sergeant moved his section to overwatch positions with Company C(-) to provide AD coverage for the crossing. The platoon leader continued with Company B(+) overwatching the crossing of Company A.

Covered by the suppressive fires of Companies B(+) and C(-), Company A crossed the river south of CP 87. With two bridges in, the tank platoons of Company B(+) crossed to join in the assault. Enemy forces, consisting of two reinforced

platoons, were quickly overrun from the flank and rear. The Vulcan platoon leader observed a friendly APC suddenly explode to his front near CP 87. Scanning the horizon, he observed an Mi-24 assault helicopter dip below the ridgeline. The platoon leader notified the battalion task force commander of the helicopter threat in their vicinity. Both Vulcan sections continued to watch for the helicopter, saw it move along the ridgeline, and immediately engaged it. The helicopter was destroyed.

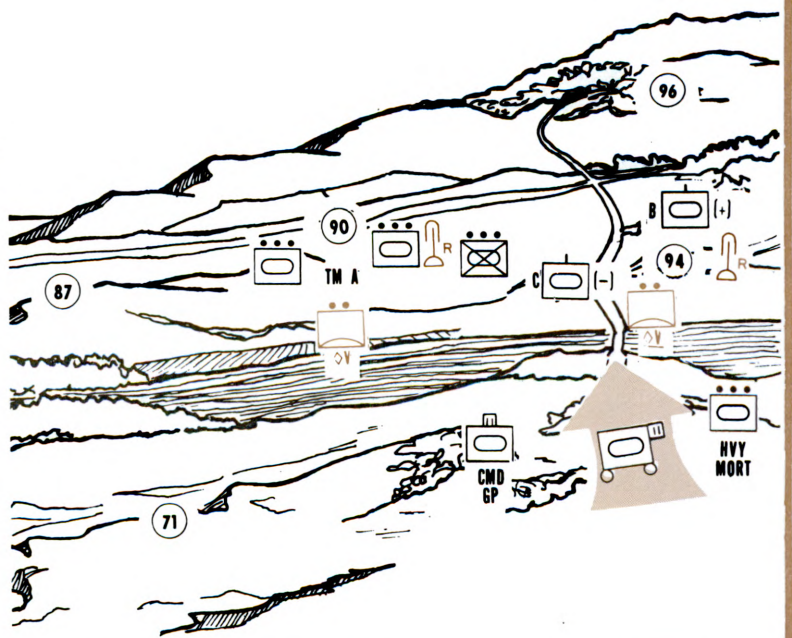


The task force commander ordered Company B(+) to continue rapidly to the east to secure the key terrain at CP 94. He ordered the Vulcan platoon leader to support Company A with one section to overwatch Company B(+) move. Company C(-) with the other Vulcan section continued to overwatch the move. Mortars continued smoke to cover the movement.



Having destroyed enemy forces in the area, the task force commander undertook actions to consolidate his positions. The remainder of the task force (Company C(-), mortars, trains, and Vulcan platoon) were brought forward.

The Vulcan platoon and Redeye teams deployed to support the TF and covered the low-altitude avenues of approach.



CHAPTER 8

SUPPORT of DEFENSIVE OPERATIONS

The goal of defensive operations is to defeat an enemy attack by inflicting heavy losses on his forces while minimizing our own losses. A commander will make the decision to defend for several reasons. Primarily he will do so to destroy the enemy. Other reasons include:

- To wear down the enemy forces prior to attacking them.
- To retain or deny the enemy terrain, facilities, installations and activities, or to preserve forces essential to the mission.
- To gain time for other operations elsewhere.

This chapter describes how the Chaparral/Vulcan battalion supports defensive operations. Included are:

- A general discussion of the organization of the defensive battlefield.
- An overview of how air defense artillery supports defensive operations.
- A portrayal of how the C/V battalion might be task organized and employed in a defensive scenario.

As in the previous chapter, this discussion is not intended to fully educate its readers on the tactics and techniques used by maneuver forces in the defense. A thorough study of FMs 71-1, 71-2, 71-100, and 71-101 is required.

THE ACTIVE DEFENSE

The "active defense" capitalizes on the mobility of the maneuver and fire support systems of the division in order to concentrate sufficient combat power at the decisive time and place. The defense is designed to defeat an enemy that is initially superior in numbers of men and materiel. The defensive system cannot be equally strong across the entire front. Therefore, locating the enemy's main thrust is essential to success. The division remains flexible, has its forces organized and prepared to react to concentrate favorable force ratios against the enemy main thrust. This concentration

CONTENTS

	PAGE
The Active Defense	8-1
How ADA Supports the Defense	8-4
Defensive Operations—Scenario	8-6

requires acceptance of risks in less threatened sectors. The division maximizes the effectiveness of its weapon systems and exploits all the advantages of the defender.

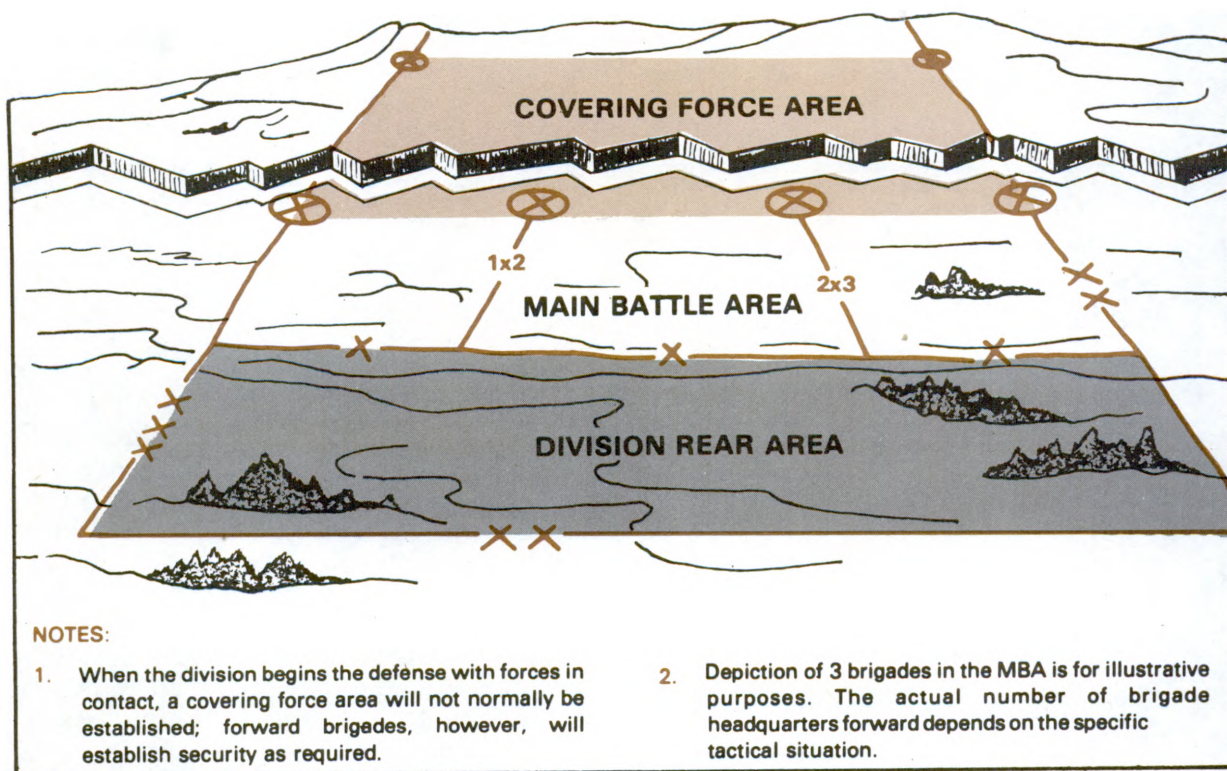
The active defense is characterized by the deployment of strong combined arms forces as far forward as possible and in depth throughout the defensive sector. The defender continuously wears the attacker down by confronting him early and successively from prepared positions. The enemy constantly encounters shifting defense forces that are taking maximum advantage of the terrain. Only terrain that is considered absolutely vital to the defense is retained.

When the enemy has been weakened and his forward elements are exposed, the forward elements are destroyed by fire, or, if necessary, by limited counterattacks. When counterattacks by fire and maneuver are conducted, forces move over covered routes

under the overwatching fires of the enemy. In addition to destroying weakening enemy forces, counterattacks are oriented on regaining previously occupied key battle positions or terrain considered vital to the defense.

Normally, only a small reserve is retained at each echelon. The reserves at brigade and battalion task force level will be used primarily to block, reinforce, or conduct limited counterattacks.

To perform a defensive mission *the division allocates forces for operation in three areas: Covering Force Area (CFA), Main Battle Area (MBA), and the Division Rear Area.* The width, depth, organization, and mission of forces in each of these areas vary based on the commander's analysis of the division mission, knowledge of the terrain, strength, and usual tactics employed by the enemy, and the capabilities of division forces.



COVERING FORCE AREA

The Covering Force Area extends forward from the forward edge of the sector that the division has been assigned to defend to where contact is made with the enemy. Forces in the CFA provide a shield behind which the bulk of the division's combat force plans and constructs the major part of the defensive system. These forces may be under the control of corps, division, or brigades. Corps normally designates the covering force area. Where possible, the CFA is deep enough that fighting in this area requires early deployment of a major portion of the enemy's available field artillery and air defense weapons so they must cease firing and displace before they can join in an attack of the MBA. This separates enemy maneuver units from a portion of the fire support that is so vital during the critical opening stages of the battle against MBA forces.

Forces in the CFA attempt to force the enemy to reveal his intentions by causing him to concentrate maneuver units and echelon artillery. This causes the enemy to reveal the most likely place of his

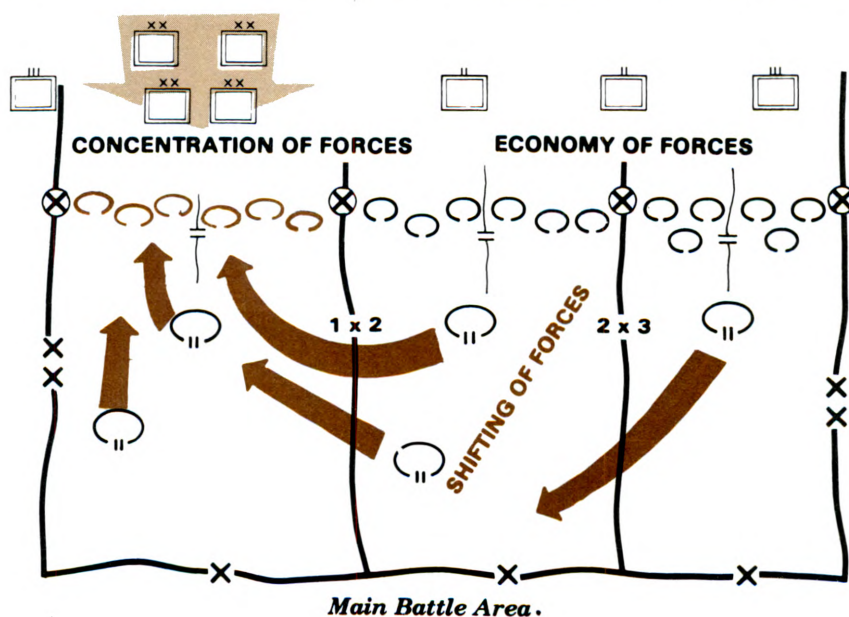
breakthrough attack and provides defending forces in the MBA additional time to prepare positions and obstacles.

MAIN BATTLE AREA

The Main Battle Area is bounded by corps-designated coordination points that establish the forward edge of the main battle area (FEBA) and division-designated rear boundaries of the forward defending brigades. It is anticipated that the decisive battle will be fought by the forward committed brigades in this area. Once forces in the CFA have delayed the enemy, made him deploy for the attack, and have identified the location of his main thrust, battalion task forces are shifted in the MBA to concentrate the fight against the enemy when and where the odds are best. Elsewhere in the MBA, economy of force missions, often requiring delay tactics to maintain contact and prevent the enemy from bypassing in these areas, are assigned to other battalion task forces.

REAR AREA

The Division Rear Area is located behind the MBA. It begins at the rear boundaries of the forward committed



brigades and extends rearward to the corps-designated division rear boundary. The division commander insures that combat service support is projected forward from this area to sustain the defending forces. Division Support Command (DISCOM) is the principal agency that carries out this task, assisted by selected elements of the Corps Support Command (COSCOM). Because of time-distance realities, COSCOM may locate selected elements such as COSCOM ammunition supply points (ASP) and petroleum, oil, and lubricant (POL) distribution points in the division rear area. When the battle is especially fluid, it may also be necessary to locate brigade trains in the division rear area. Here too, are administrative echelons and communication centers. The division main command post may also be found in the division rear area. Reserve elements from corps and division may also be located in the division rear area.

HOW ADA SUPPORTS THE DEFENSE

As with the offense, air defense artillery support of defensive operations is vital. When properly employed in support of a division conducting defensive operations, **air defense artillery can:**

■ **Limit or deny enemy aerial reconnaissance of our forces.** If permitted to operate freely, enemy reconnaissance aircraft can determine the location of our forces and can detect the movement of our units to concentrate in the MBA. This information would provide the enemy a significant advantage in the conduct of his offensive operations against us.

■ **Destroy, drive away, or reduce the effectiveness of enemy helicopters and high-performance aircraft attacking our maneuver, combat support, and combat service support elements.** Without ADA protection, the movement of forces, which is essential to the success of the

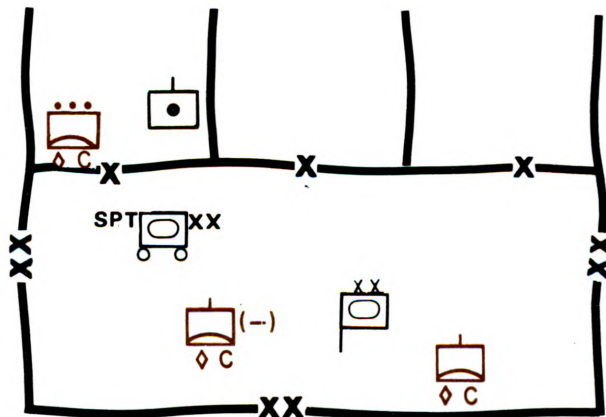
active air defense, may be thwarted by enemy air attacks on our maneuver units and their control and supporting elements.

■ **Provide third-dimension artillery support for our helicopters and close air support aircraft by limiting or denying enemy use of the airspace over portions of the battlefield.** Without ADA to suppress enemy air, our forces may be deprived of needed aviation and close air support.

CHAPARRAL/VULCAN BATTALION

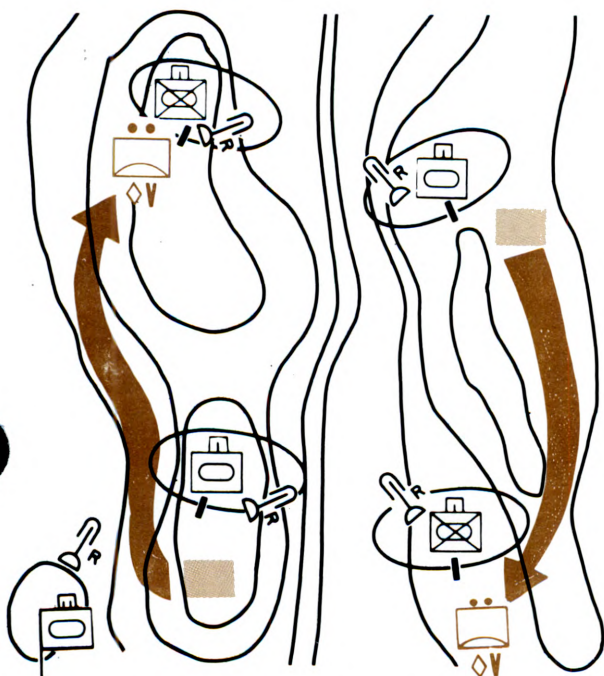
Air defense **priorities** for the **Chaparral/Vulcan battalion** will normally **include:**

Critical assets in the brigade and division rear areas such as command and control facilities, logistical support units, and fire support units. Chaparral is used primarily for defense of these assets. When available, Vulcan will be employed with Chaparral to provide mixed weapon defenses of these assets.



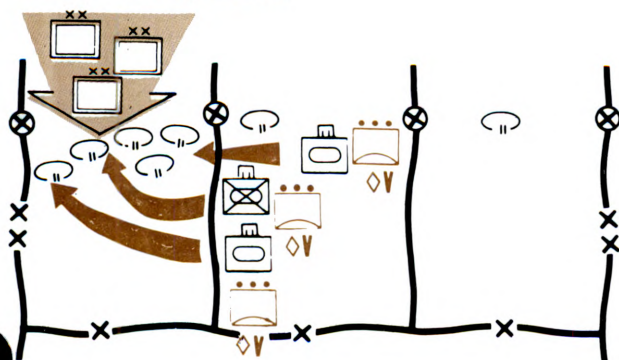
Battalion task forces in the CFA. Here, so-called "gun screens" may be established. The Vulcan platoon supporting a battalion task force positions its weapons with one or two company teams to overwatch their movement. Vulcans engage helicopters and aircraft attacking the company or attempting reconnaissance. At a

predetermined time, the Vulcan platoon moves by covered and concealed routes to support another company team in a similar fashion. This movement between company teams deceives the enemy as to the actual location and size of the air defense unit and the force it is supporting while providing defense against the enemy ATGM helicopter and aircraft threat.



Movement of Vulcan Platoon by Section (Two Squads) Between Company Teams.

Battalion task forces in the main battle area as they shift to concentrate. Vulcan platoons provide air defense for these task forces as they move.



REDEYE

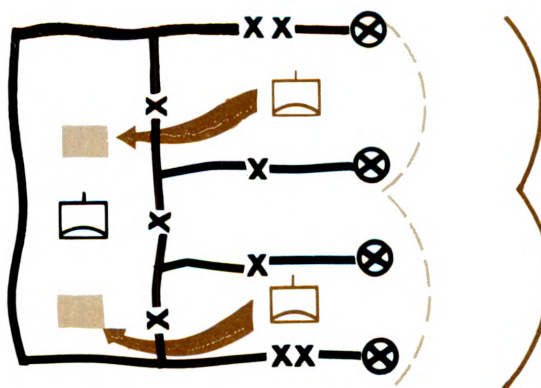
Redeye sections provide dedicated air defense protection for battalion task forces, field artillery battalions, and the armored cavalry squadron. When Chaparral and Vulcan elements support these units, defenses are coordinated and integrated.

REFERENCE

Information on Redeye support of defensive operations is contained in FM 44-23.

HAWK BATTALION

The Hawk battalion normally provides coverage for the entire division area of operations. Initially, some Hawk units will be positioned well forward to extend coverage over the units in the CFA.



REFERENCE

Detailed information on Hawk support of defensive operations is contained in FM 44-90.

DEFENSIVE OPERATIONS—SCENARIO

GENERAL

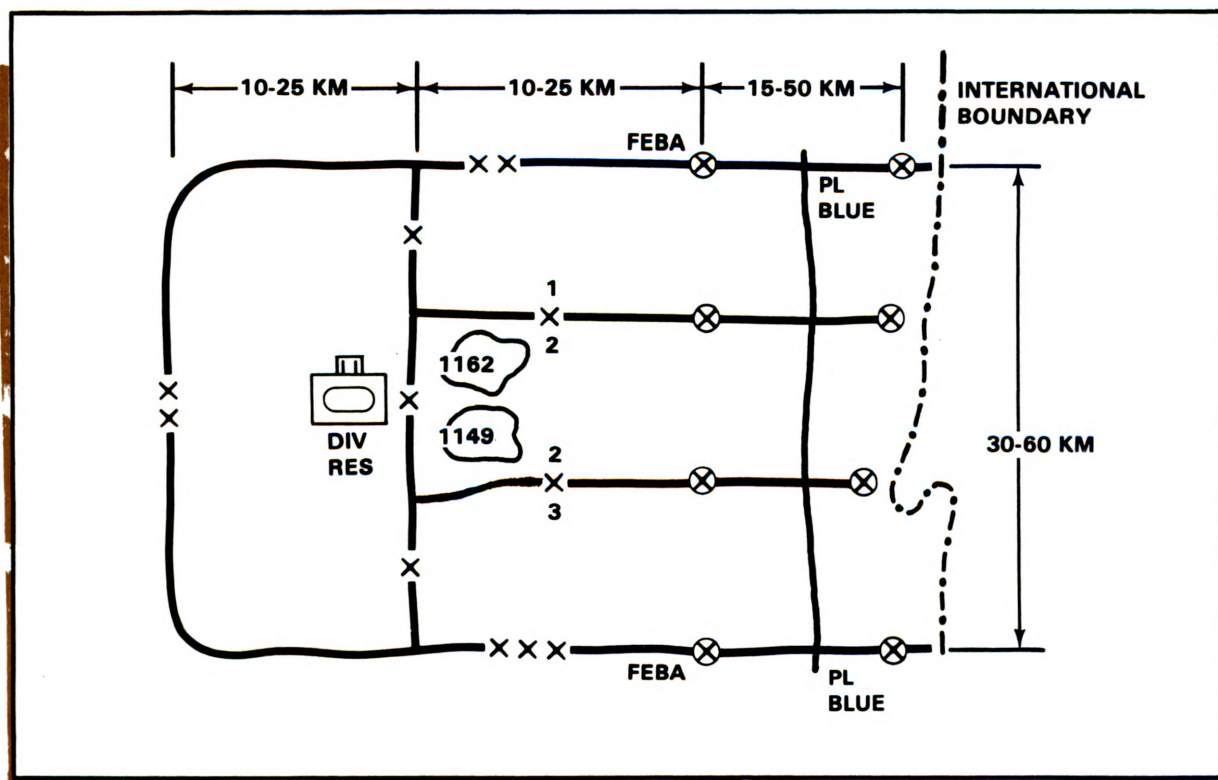
A scenario is used to illustrate how the Chaparral/Vulcan battalion supports a division conducting an active defense. The intent is to reinforce the principles and guidelines previously discussed. The scenario shows how the C/V battalion commander, having developed an initial organization for combat, continually

reassesses the situation and reallocates his limited ADA resources to defend the commander's changing priorities for the protection of the division's most critical and vulnerable assets. Also shown is how a brigade commander uses his DS Vulcan battery to support battalion task forces in the covering force and main battle areas.

INITIAL SITUATION AND DIVISION PLAN

A US armored division, as part of a corps, is deployed on a front of approximately 50 kilometers and is assigned the mission:

“DEFEND IN SECTOR, RETAIN HILLS 1162 AND 1149.”



Division Operations Overlay.

OPLAN

DIVISION PLAN
(Extract)

NOTE: RATHER THAN PROVIDE NUMERICAL DESIGNATIONS, FORCE COMPOSITION IS REFLECTED IN THE TASK ORGANIZATION BELOW.

1ST BDE

1-Tk Bn
2-Mech Bn
ADA: 1-Vul Plt (DS)
FA: 1-155 Bn (DS)
Engr: 1-Engr Co (DS)

2D BDE

2-Tk Bn
2-Mech Bn
1-Armd Cav Sqdn
ADA: 1-Vul Btry (DS)
1-Chap Plt (ATCH)
FA: 1-155 Bn (DS)
Engr: 1-Engr Co (DS)

3D BDE

2-Tk Bn
1-Mech Bn
1-Armd Cav Sqdn (ACR)(OPCON)
ADA: 1-Vul Btry(-) (DS)
1-Chap Plt (ATCH)
FA: 1-155 Bn (DS)
Engr: 1-Engr Co (DS)

DIVISION ARTILLERY

1-8" Bn (GS)
1-FA Brigade
1-155 Bn (GS-R 1st Bde DS Bn)
1-155 Bn (Reinf 2d Bde DS Bn)
1-155 Bn (GS-R 3d Bde DS Bn)
1-8 Bn (GS; o/o GS-R 2d Bde DS Bn)
1-175 Bn (GS)

CORPS ASSETS:

ATTACHED:
DIRECT SUPPORT: 1-Hawk Bn
OPCON:

DIVISION CONTROL

1-Tk Bn
1-Atk Hel Co (OPCON)
C/V Bn(-)
Engr Bn(-)
1-Engr Bn (Combat) (OPCON)
CEWI Bn

1. Situation

2. Mission. Division defends in sector (DTG); establishes a covering force to delay enemy forward of the main battle area (MBA); retains hills 1162 and 1149.

3. Execution.

a. *Concept of Operation.* Annex B (Operation Overlay).

(1) Maneuver. Div defends in sector with three bdes abreast; 1st bde in the north, 2d bde in the center, and 3d bde in the south. Retention of hills 1162 and 1149 is critical because both hills dominate the enemy avenues of approach. Maximum emphasis will be focused on destruction of enemy by fire and maneuver in depth. Brigades control and direct covering

force operations and delay enemy forward of main battle area for at least 24 hours effecting maximum losses on enemy forces. ***The main effort will probably be in the sector of the 2d bde. It is expected that the decisive battle will be fought there. Therefore, priority of fires and support is to the 2d bde.*** Brigades will be prepared to release or receive, on short notice, uncommitted or lightly engaged battalion task forces or company teams to allow concentration of forces in threatened sectors, priority to 2d, 3d, and 1st bdes in that order. Bns should be prepared to move on 15-minute notice. If the battle develops along other lines, appropriate orders will be issued. All bdes will effect maximum attrition in sector.

• • • • •

b. 1st Bde:

- (1) Establish covering force in sector with a minimum of one battalion task force and delay enemy forward of main battle area for at least 24 hours.
- (2) Defend in sector.
- (3) Be prepared to release one mech battalion TF to 2d or 3d bde.
- (4) Be prepared to receive up to three (3) additional battalions for defense of sector.
- (5) Be prepared to receive OPCON of attack helicopter company.

c. 2d Bde:

- (1) Establish covering force in sector with a minimum of two battalion task forces and delay enemy forward of main battle area (MBA) for at least 24 hours.
- (2) Defend in sector, retain hills 1162 and 1149.
- (3) Be prepared to release up to two bn TFs to 3d and 1st Bde in that order.
- (4) Be prepared to receive up to three additional battalions for defense of sector.
- (5) Be prepared to receive OPCON of attack helicopter company.

d. 3d Bde:

- (1) Establish covering force in sector with the Armd Cav Sqdn (ACR) as a minimum and delay enemy forward of main battle area (MBA) for at least 24 hours.
- (2) Defend in sector.
- (3) Be prepared to release one tank bn TF to 2d or 1st bde in that order.
- (4) Be prepared to release Armd Cav Sqdn (ACR) upon closure of covering force into the MBA.
- (5) Be prepared to receive up to three additional battalions for defense of sector.

e. Attack Helicopter Company. Be prepared for employment in 2d, 3d, or 1st bde sectors, in that priority. Establish liaison with each brigade and assist in planning for employment.

• • • • •

g. Air Defense Artillery:

(1) Initial priorities for Chaparral/Vulcan battalion to CFA, DISCOM Class III distribution point, 2d and 3d bde trains, and division main CP, in that order.

(2) When enemy main thrust is identified and concentration of forces in MBA is ordered, priorities for C/V change as follows: Battalion task forces shifting to concentrate, DISCOM Class III distribution point, brigade trains, division main CP and CFA, in that order.

(3) DS Hawk battalion provides area coverage for entire division area of operation. Initial coverage to be extended well forward for protection of forces in the CFA.

• • • • •

j. Reserve. TF Tank. Be prepared for commitment in 2d, 3d, or 1st bde, in that order.

DIVISION CONTINGENCY PLANNING AND RESPONSE TO ENEMY ATTACK

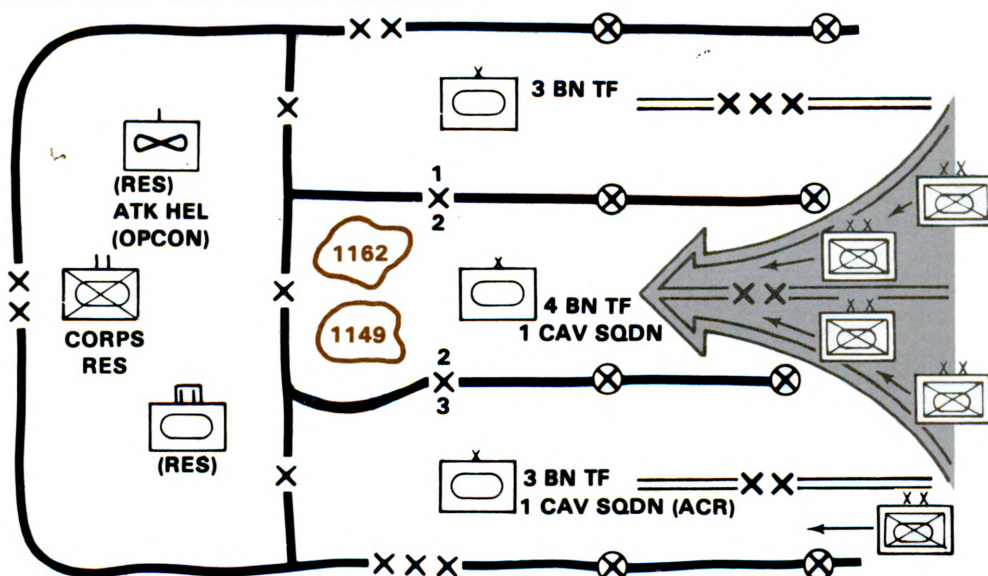
Normally, *the division develops a series of contingency plans prior to hostilities*. The defensive order, with associated contingency plans, is disseminated to members of the staff and all subordinate/attached units prior to the battle. This allows the staff and units an opportunity to plan their actions and develop supporting plans for each contingency. Realistically, contingency plans will not be executed as written since they are based on a number of assumptions. Modification will be the norm rather than the exception. However, having contingency plans prepared and disseminated in advance allows time for planning and implementing orders.

If there is insufficient time to develop detailed contingency plans, the commander and appropriate staff members must develop courses of action as the battle unfolds. This is accomplished by constantly wargaming and reviewing the defensive scheme to deal with various situations. The staff and subordinate commanders are kept informed of the situation through verbal warning and fragmentary orders.

As the division air defense officer, the C/V battalion commander, assisted by his staff, participates in this development of contingency plans and courses of action and keeps his subordinate commanders informed of probable actions and requirements.

As the battle began, units in the covering force area engaged the enemy with such force and violence that the enemy massed to launch a breakthrough attack with elements of his first echelon divisions.

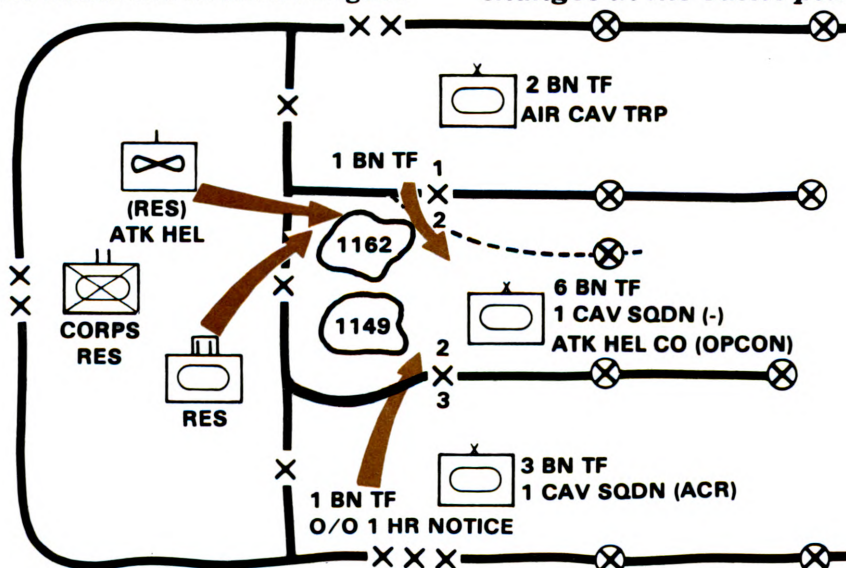
Based on intelligence reports, the division commander concluded that the enemy intended to mass for a breakthrough attack in the 2d Brigade sector.



Anticipated Enemy Breakthrough

To defeat the enemy attack, the division commander had to concentrate more maneuver battalions in the 2d brigade

sector. He directed the G3 to issue fragmentary orders to reflect the changes in his battle plan as depicted.



Change in the Battle Plan

The division commander's decision included:

- Narrowing the 2d brigade sector.
- Increasing the 2d brigade maneuver force from 5 to 7 battalion-size maneuver units and placing the attack helicopter company OPCON to the brigade.
- Accepting the greater risk in 1st brigade sector and using the air cavalry troop in economy of force role.
- Providing sufficient force in the 3d brigade sector.
- ***Providing priority of artillery and air defense artillery fire support to the 2d brigade.***
- Allocating appropriate support from the battlefield systems, in particular air/ground, EW, engineer and combat service support, to make the revised concept work.

ADA PLANS AND ACTIONS TO SUPPORT THE DIVISION

Since the C/V battalion commander and his staff had participated in the preparation of the division plans to support this contingency, the battalion was prepared to implement changes in the task organization to shift priority to battalion task forces moving to concentrate and to increase the air defense protection for 2d brigade.

In developing air defense priorities and allocating resources to support the scheme of maneuver, he had considered the factors of—

- **CRITICALITY**
- **VULNERABILITY**
- **RECUPERABILITY**
- **ENEMY AIR**

AND

- **The need for mass.**
- **The desirability of mixed weapon defenses.**
- **Weapon capabilities and limitations.**
- **Other available air defense protection.**
- **Defense "sharing."**

In this situation—

■ The forces of the 2d brigade will be the most critical to the success of the operation. Threat air forces are likely to use the preponderance of their ground attack aircraft in support of the main attack in the 2d brigade sector. The forces in the 2d brigade area will be occupying relatively smaller defensive ***battle areas*** and will probably be moving continually as the battle develops. This will increase their exposure and vulnerability to air attack. On the other hand, with forces concentrated in smaller areas, the commander may be able to protect more assets with fewer weapons (defense "sharing").

■ By comparison, task forces in the 1st and 3d brigade areas will be more dispersed while defending their ***sectors of responsibility*** and should be able to make more extensive use of passive air defense maneuvers (digging in, camouflage, etc.).

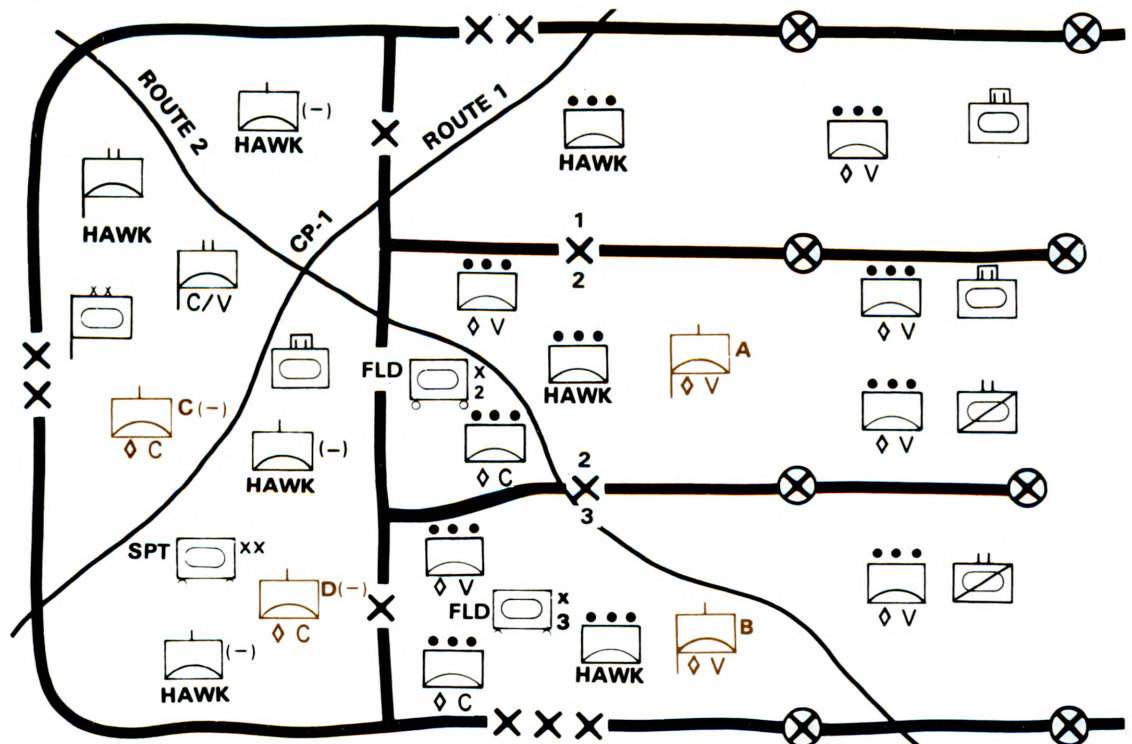
■ Command, control, and logistical support elements (main CP, DISCOM elements, and brigade trains) remain critical to the success of the operation, are relatively vulnerable to air attack, lack recuperability (e.g., POL stocks are in short supply within the division and corps), and are likely targets for air attack.

■ Vulcan should support maneuver elements; Chaparral should defend units and other assets that move less frequently.

■ The Hawk battalion, which has had three of its nine platoons deployed forward in the brigade areas to provide coverage over the CFA, will now withdraw these platoons into the division rear area. From positions in the rear area, the batteries and platoons of the Hawk battalion will provide low- and medium-altitude coverage of the entire division area. Coverage will be weighted forward and toward the center of the division area (2d brigade sector).

■ All maneuver and field artillery battalions will use organic Redeye for close-in air defense protection. All units will be prepared to use their small arms and machineguns in an air defense role, if attacked by enemy aircraft.

The C/V battalion commander reviewed the initial task organization and disposition of ADA units—



- BTRY A** -2 Vulcan platoons supporting 1 BNTF and Cav sqdn in CFA.
1 Vulcan platoon with 1 Chaparral platoon attached from Btry C defending 2d Bde trains.
- BTRY B** -1 Vulcan platoon supporting Cav sqdn in CFA.
1 Vulcan platoon with 1 Chaparral platoon attached from Btry D defending 3d Bde trains.
1 Vulcan platoon in DS of 1st Bde and with BNTF in CFA.
- BTRY C** -2 Chaparral platoons defending the main CP.
- BTRY D** -2 Chaparral platoons defending DISCOM Class III distribution point.

In revising the ADA task organization to support the battle plan, the C/V battalion commander will try to—

- Minimize changes in the current task organization and shifting of unit locations.
- Visualize support requirements for future operations.
- Anticipate possible changes in the scheme of maneuver, retaining sufficient control of his units to rapidly react.

When the division G3 issued the orders to change the battle plan, the *C/V battalion commander directed his S3 to issue fragmentary orders to implement the following actions and changes in the task organization to support the revised plan:*

- Vulcan platoon now DS to 1st bde—move now from CFA, join with and support the battalion task force moving to 2d brigade sector. On arrival, attached to Battery A.

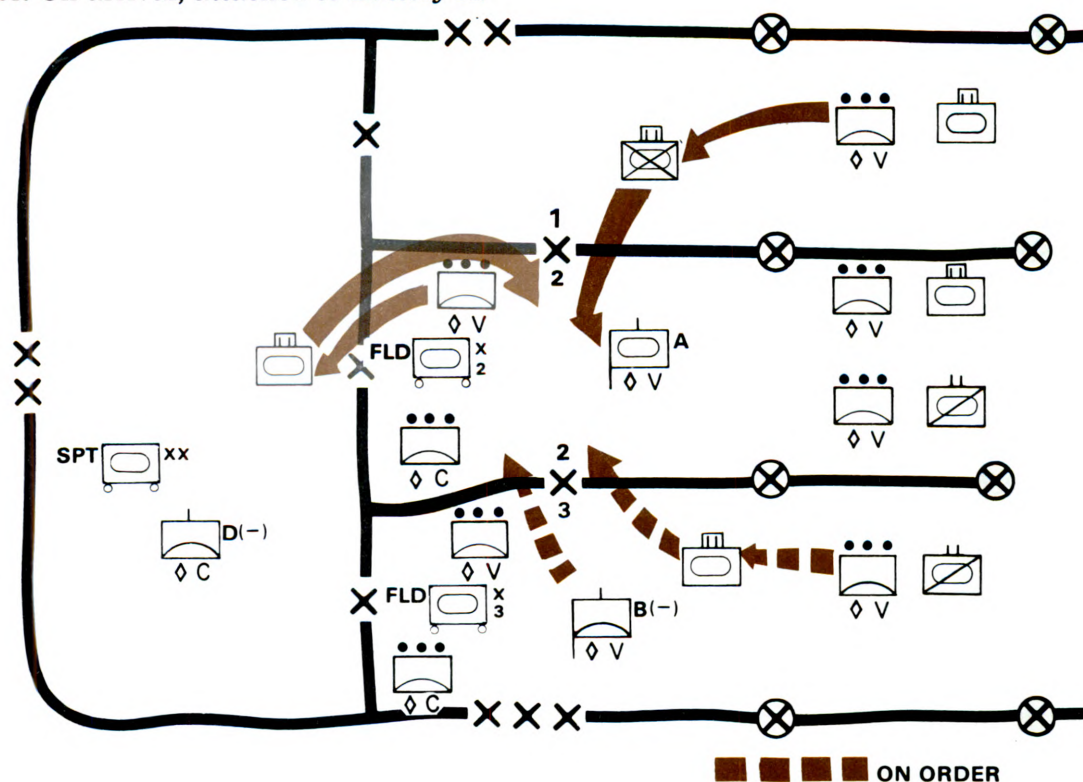
- Vulcan platoon now defending 2d brigade trains—move now to joint with and support the division reserve task force as it moves to 2d brigade sector.

- Battery B, now DS to 3d Brigade, be prepared on 30-minute notice to accept a mission of general support-reinforcing Battery A. If GSR mission is assigned—

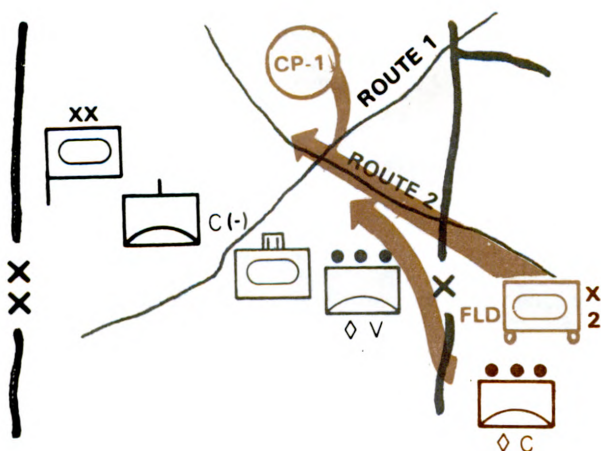
- Move one Vulcan platoon to join up with and support the battalion task force to be committed on division order in the 2d brigade sector.

- Keep Vulcan and Chaparral platoons now defending 3d brigade trains in that position.

- Plan to position battery CP vicinity coordinates _____ for control of two Vulcan platoons in 2d brigade sector.



■ Having learned that the 2d brigade trains would be moving to a position in the division rear area in about 2 hours, the Chaparral platoon now defending them was directed to move out in 1 hour and establish a defense at checkpoint 1. This intersection of two heavily traveled routes had been subject to several interdiction air strikes by the enemy over the past 24 hours. The division reserve battalion task force will be crossing this intersection at about the same time as the brigade trains. There is a good possibility of traffic congestion, particularly if these unit movements do not proceed exactly on schedule. The Chaparral platoon was ordered to defend the intersection until both the task force and the trains had passed, then on battalion order, move to establish a defense of the trains at the new location in the division rear area. The platoon was relieved of attachment to Battery A and reverted to the control of Battery C.



In addition, the C/V battalion commander—

■ Through the DS Hawk battalion CP, requested and received authority from the region air defense commander for the division commander to change to a less restrictive weapons control status for C/V units in the 2d brigade area. The DAME

coordinated the change with other staff elements and the message was disseminated to all units concerned by the C/V battalion TOC.

"Change in weapons control status for Chaparral and Vulcan squads only—WEAPONS FREE for jet aircraft only on a westerly heading at altitudes below 10,000 feet MSL over second brigade sector."

■ Instructed his personnel in the battalion TOC and the DAME to continue working on contingency plans, to include plans to support the division, should major enemy thrust occur in the 3d brigade sector. The operations officer at the DAME was told to coordinate with the G3 and the corps ADA element to determine the availability of nondivisional Chaparral/Vulcan to augment the division, should penetrations occur in both the 2d and 3d brigade areas.

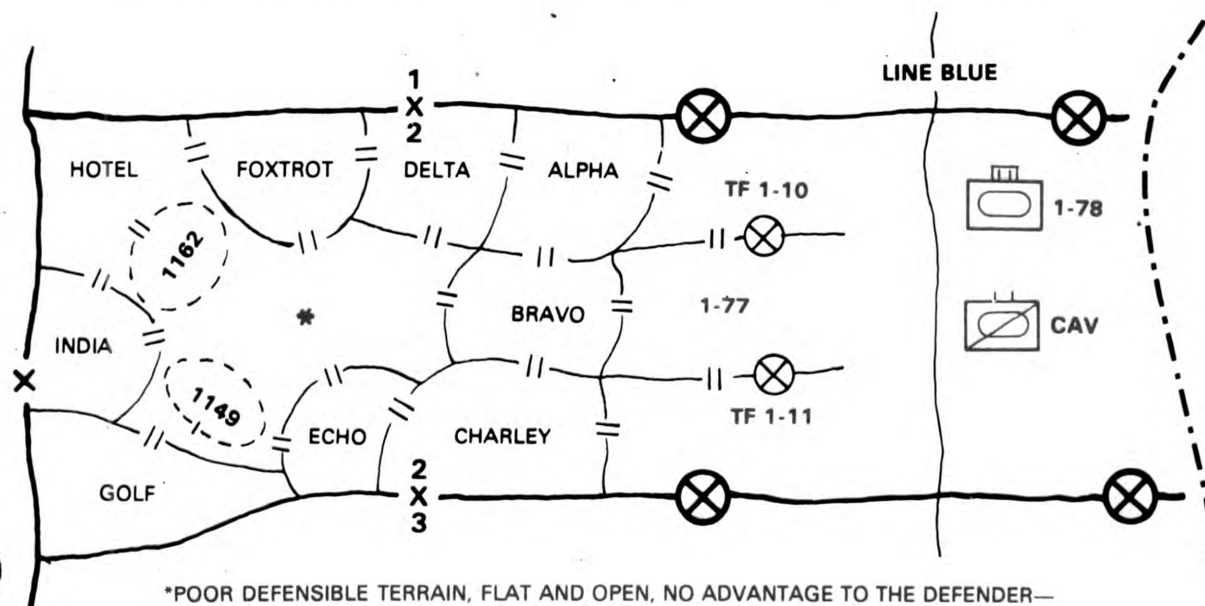
■ Informed his subordinates that, initially, he and the battalion S3 would be located at the Battery A CP in the 2d brigade area. Here, he would be in the best position to control his units in the forward area and to stay fully abreast of the developing tactical situation. He would keep in close touch with his ADA element at the division tactical CP and his air defense coordination officers at the three brigade CPs. During his absence from the rear area, the battalion executive officer would control and supervise the actions of the headquarters and Batteries C and D.

VULCAN SUPPORT OF SECOND BRIGADE

The C/V battalion's air defense coordination officer was present at the 2d brigade command post when the brigade commander stated his concept of the defense to his staff.

The concept included—

"...I envision the following plan of defense...We will defend with three task forces in the MBA...As directed by division, we will establish a covering force consisting of one tank-heavy task force and the armored cavalry squadron..."



"The probable occurrence of events during the battle will be the covering force operation, the hand-off of the enemy to MBA units, and maneuver by battalion task forces, in the MBA, to stop the enemy before he reaches Hill 1162. If the enemy does reach Hill 1162, the battle will pivot around this position. I visualize that TF 1-10 will be the force that finally occupies Hill 1162..."

"ADA will initially orient on the protection of the covering force and the brigade trains, then on task forces maneuvering in the MBA. Once the covering forces withdraw, I want priority for Vulcan support to go to task forces that are moving within the MBA. When the hand-off of the enemy from the covering force to MBA units occurs at line BLUE and TF 1-78 and the cavalry squadron withdraw through TF 1-10 and 1-77, have the Vulcan platoons drop off and support these task forces. As I said earlier, I expect the main attack will be in the northern part of our sector and TF 1-10 and 1-77 are likely to be the first MBA units to shift positions. The Vulcan platoons with the task forces moving to reinforce the brigade should remain with those task forces, at least initially, the brigade S4..."

The air defense coordination officer met with and briefed the C/V battalion commander and the Battery A commander

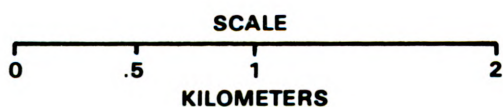
on the brigade commander's plan. Necessary orders to implement the plan were issued to the Vulcan platoons.

While the division was taking action to concentrate forces in the 2d brigade sector, all-source intelligence and covering force battle reports confirmed that the enemy main effort was being directed toward the northern sector of the 2d brigade. The covering forces fought stubbornly, giving ground

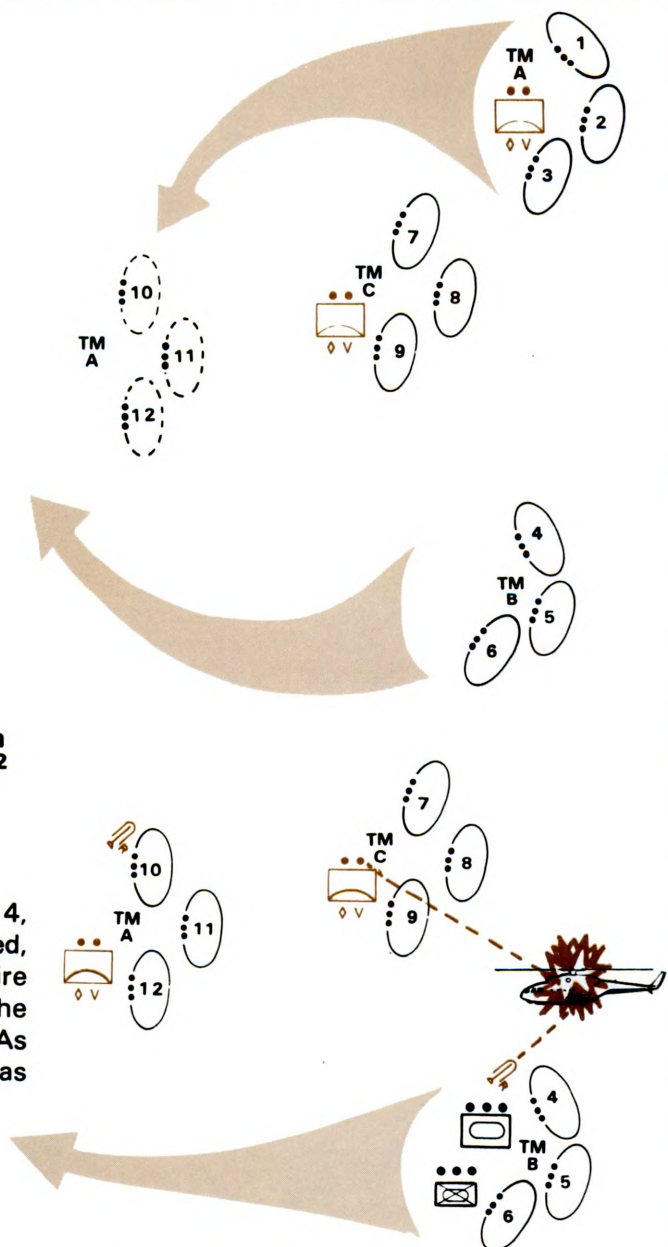
grudgingly. Before becoming decisively engaged, they maneuvered to new positions, and continued the battle. The Vulcan platoons maneuvered with and provided protection for these forces as they withdrew to line BLUE.

EXAMPLE

At one point, the commander of TF 1-78 was using Team C to overwatch a withdrawal of Teams A and B. He directed the Vulcan platoon leader to support Team C with a section of Vulcans and the other section of Vulcans to support Team A as it moved to an overwatch position behind Team C at Battle Positions (BPs) 10, 11, and 12.

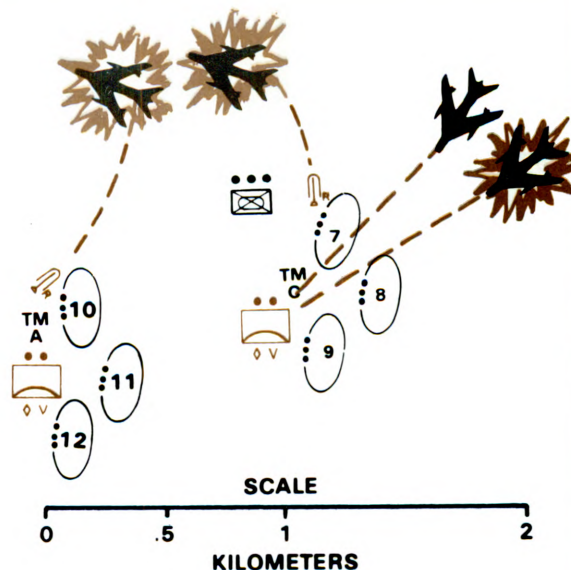


As portions of Team B withdrew from BP 4, 5, and 6, a Threat helicopter attacked, firing ATGMs. Assisted by small arms fire from Team B and the Redeye team, the Vulcan section engaged the helicopter. As it made a turn to exit the area it was destroyed.

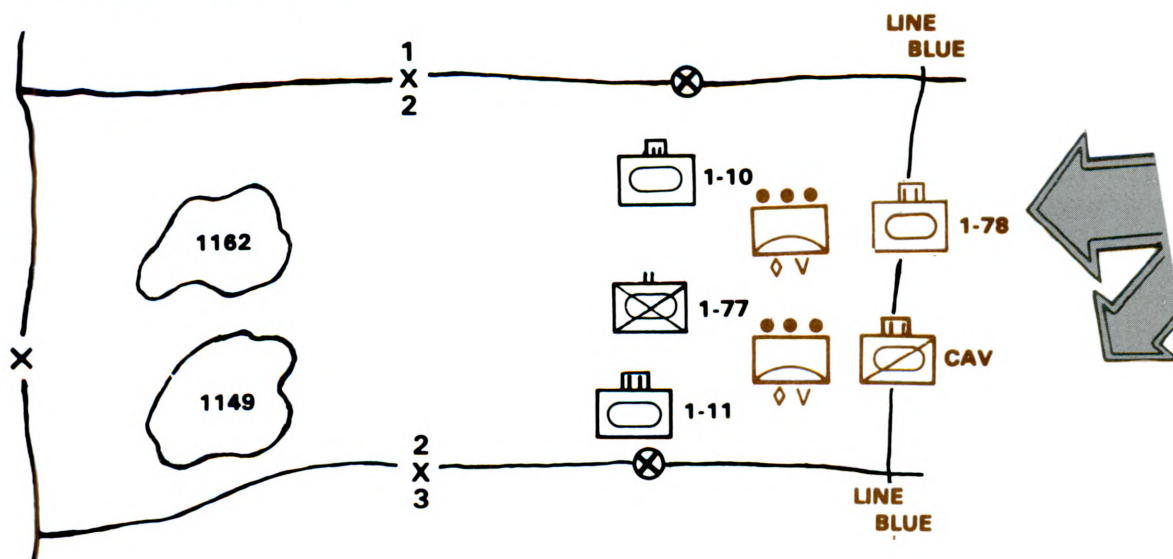


EXAMPLE
continued

Team A was in position at BP 10, 11, and 12 with a Vulcan section and ready to overwatch the withdrawal of Team C. As Team C withdrew from BP 7, 8, and 9, enemy aircraft made a pass to attack the area. Team C commander directed all elements to disperse and seek cover. The Vulcan platoon leader directed the Vulcan section with Team C to take up firing positions to engage the aircraft as they made their attack run. The aircraft came in for an attack and were engaged by the Vulcans along with small arms and Redeye teams. Three of the aircraft were destroyed and the fourth one was driven off.



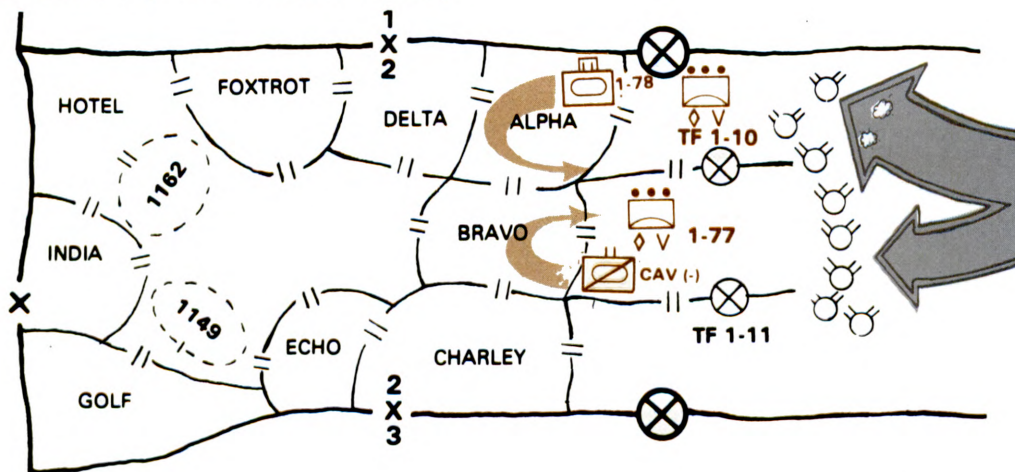
As the enemy closed to line BLUE, the covering forces handed off the enemy to units in the MBA.



The forward task forces provided overwatching fires to assist the TF 1-78 and the cavalry squadron to break contact with the enemy. The covering force passed through predetermined passage points along the FEBA and the brigade commander directed TF 1-78 to move to BA ALPHA and the cavalry squadron to move to BA BRAVO.

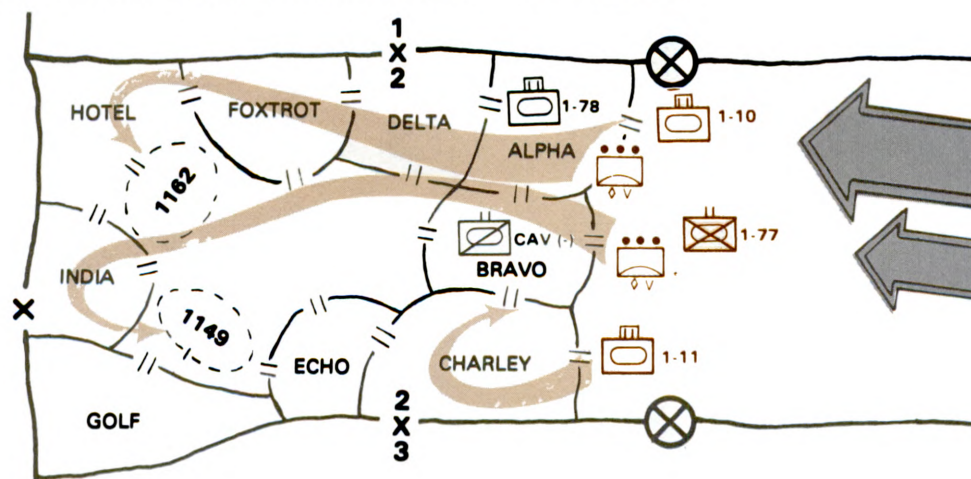
Prior coordination with TF 1-10 and 1-77 had been made by the Vulcan battery

commander. Tentative positions for the Vulcan platoons had been selected. As the platoons withdrew with the covering forces, they were met by guides and first led into covered and concealed positions for resupply and refitting by battery and battalion support personnel. They were then deployed to firing positions in support of the company teams of the MBA task forces.



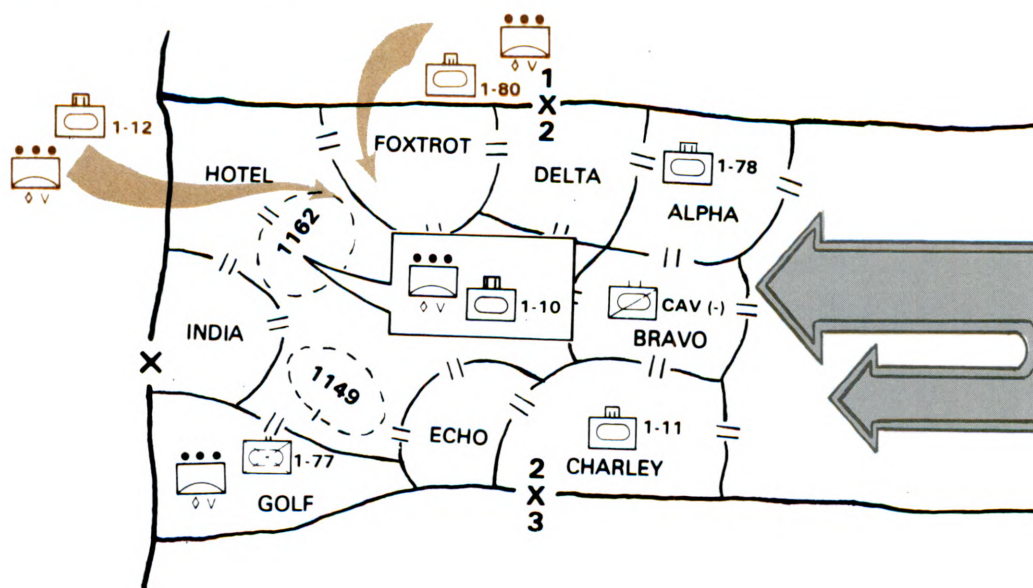
As the battle progressed, battalion commanders fought their company teams to rearward positions in accordance with their battle plans. Brigade lateral boundaries were adjusted. TF 1-10 was ordered to move back to occupy 1162 under the overwatch protection of BA ALPHA. 1-77 was directed to move

under the overwatch protection of BA BRAVO, to BA GOLF and occupy 1149. Vulcan platoons accompanied and supported TF 1-10 and 1-77 as they moved and established the new defensive positions. TF 1-11 was directed to move to and occupy BA CHARLEY.



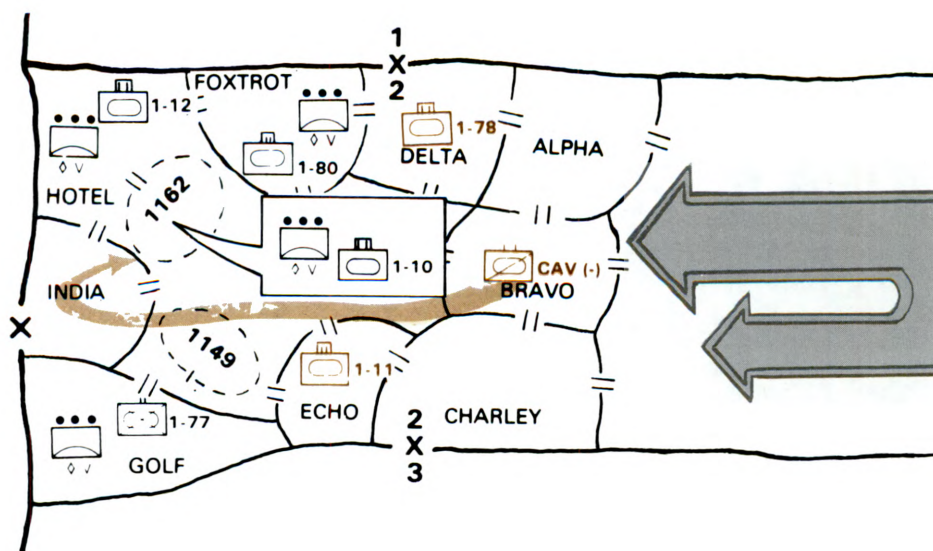
The two reinforcing battalion task forces, with supporting Vulcan platoons, arrived in the 2d brigade sector. TF 1-12 was

committed to BA HOTEL and TF 1-80 to BA FOXTROT.



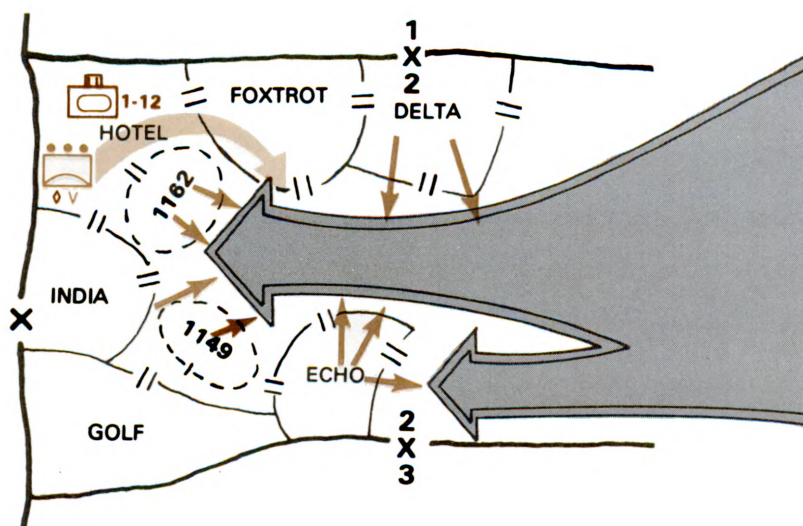
The enemy continued to apply pressure. The brigade commander directed the cavalry squadron (-) to overwatch from the flank and cover the movement of TF 1-78 into BA

DELTA. TF 1-11 moved to BA ECHO and the cavalry squadron (-) moved to BA INDIA under the overwatch of TFs 1-11 and 1-78.



The enemy main effort attempted to slip to the south to follow a path of least resistance and continued its advance toward Hill 1162. In doing so, he was simultaneously engaged by tanks, antitank guided missiles, and field artillery. Tactical air support continued to strike his trailing echelons. Artillery kept enemy infantry separated from their tanks.

As the nose of the enemy attack reached 1162, the brigade commander directed TF 1-12 armor to conduct a local counterattack into the enemy flank under the overwatching fires of 1162 and BA FOXTROT. The Vulcan platoon supporting TF 1-12 accompanied the task force as it counterattacked and provided defense against air attack.



The enemy attacking second brigade was destroyed. Much of the brigade's success in this action was attributable to its ability to maneuver so that it could concentrate combat power in time at the decisive place. The presence of Vulcan and Redeye with the

maneuver elements, combined with the umbrella coverage of the DS Hawk battalion, helps the ground commander to retain his freedom of maneuver, even in the face of a heavy enemy air threat.



CHAPTER 9

COMBAT SERVICE SUPPORT

Combat service support (CSS) is that support provided operating forces primarily in the fields of administration, chaplain services, civil affairs, finance, legal services, health services, supply, maintenance, and transportation. Each commander is responsible for combat service support for his organic and attached units. ***The impetus of CSS must be to the front—that is, it is performed as far forward as the tactical situation permits.*** The CSS system is designed so that supplies are delivered and services performed as close as possible to the actual fighting unit to reduce the support burden on the tactical commander and free him to fight his units.

This chapter deals with the organization and operation of CSS at C/V battery and higher levels and is oriented mainly on supply, maintenance, and medical services provided for and by the C/V units organic to the armored, infantry, and mechanized infantry divisions. It is applicable with modification to nondivisional C/V and pure towed Vulcan units.

CONTENTS

	PAGE
The Division Support Command (DISCOM)	9-1
Concept of CSS for Chaparral/Vulcan Units	9-3
Class I Supplies	9-4
Class II, IV, VI, VII, and X Supplies	9-4
Class III Supplies	9-5
Class V Supplies	9-6
Maintenance, Recovery, and Repair Parts	9-7
Medical	9-8

THE DIVISION SUPPORT COMMAND (DISCOM)

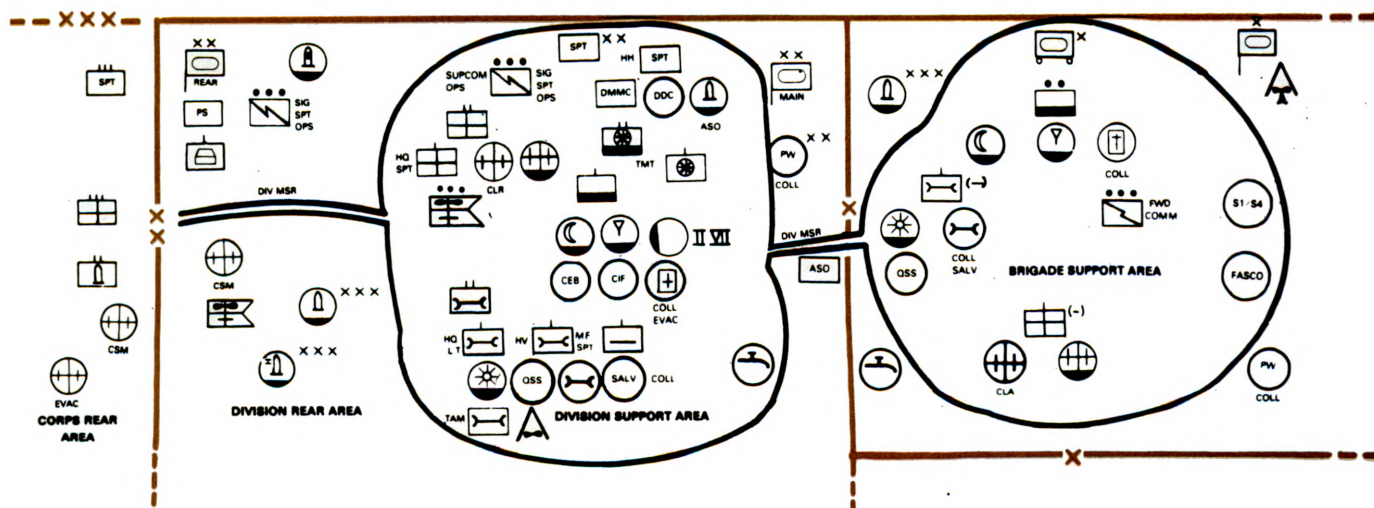
The organization tasked to provide combat service support (less COMSEC, logistics, construction, and water production) to all organic and attached

elements of the division is the DISCOM.

The DISCOM is located in the division support area (DSA) and deploys elements in the form of forward area support companies under supervision of forward area coordinating officers in the brigade trains

areas to provide the full range of combat service support for units in the forward areas. The DISCOM elements located in the DSA provide area support of all units located

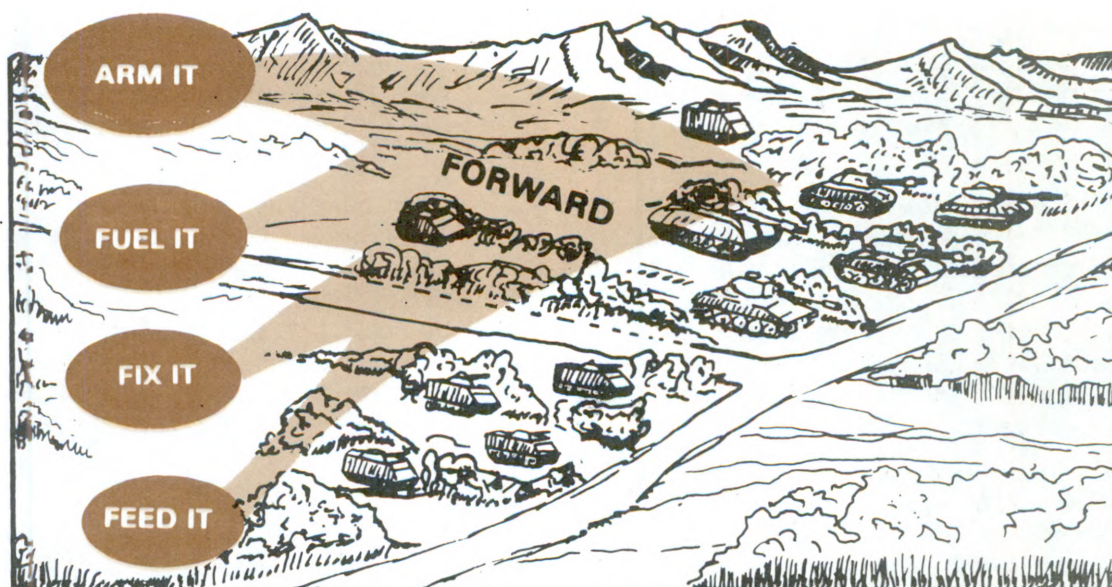
behind the brigade rear boundaries which are organic, or attached, to the division. Various *support activities* are generally located as shown.



	POL Supply Point		Graves Services		Transportation Unit
	Class I (Rations) Supply Point		Water Point		Supply Unit
	Ammunition (All types) Supply Point		Hospital or Aid Station		Ordnance Unit
	Artillery Ammunition Supply Point		Maintenance Point		Personnel Services & Administration Unit
	Special Ammunition Supply Point		Quick Supply Stores		Finance Unit
	Class VIII (Medical) Supply Point		Airfield		Signal Unit
	Class IX (Repair Parts) Supply Point		Repair & Maintenance Unit		Aeromedical Evacuation Unit
	Multiple Class Supply Point		Medical Unit		

DISCOM delivers supplies to using units whenever possible. This method of supply is called *unit distribution*. The other method is called *supply point distribution*, a process in which the user must go to a

distribution point and pick up supplies. *Most units obtain their supplies through a combination of unit and supply point distribution.*



CONCEPT OF CSS FOR CHAPARRAL/ VULCAN UNITS

Supply operating procedures are generally the same in all divisions and are normally contained in standing operating procedures (SOP). ***Two basic rules guide the handling of supplies in a division:***

■ The ***number of handlings*** necessary to break down shipments into consumer portions ***must be kept to the minimum.***

■ ***Supplies must be delivered in such a way that they can easily be handled.***

To manage requisitioning, movement, and distribution of supplies and materiel both into and within the division, ***a division materiel management center (DMMC) is assigned to DISCOM headquarters.*** It maintains complete visibility over the supply and maintenance effort ***to insure that supplies and facilities are at the place they are needed when they are needed.***

The C/V battalion headquarters provides overall legal, medical, and administrative support for units of the battalion. Through the battalion S4 and maintenance technicians, it also provides supervision of supply and organizational maintenance support of the batteries. Most of the actual supply and organizational maintenance functions are accomplished at battery level.

Normally, higher level combat service support is requested directly from the ADA battery to DISCOM agencies with information provided to the C/V battalion for follow-up as necessary. DISCOM maintains direct support unit supply points and a forward area support coordinating officer in the brigade trains area to coordinate requests for supply and maintenance support from units in the brigade area. When so specified in the division SOP, ADA batteries go directly to DISCOM in the DSA to request supplies and direct support maintenance.

CLASS II, IV, VI, VII AND X SUPPLIES

Class II - TOE, TA items
Class IV - Construction materials
Class VI - Personal demand items
Class VII - Major end items
Class X - Items to support nonmilitary programs

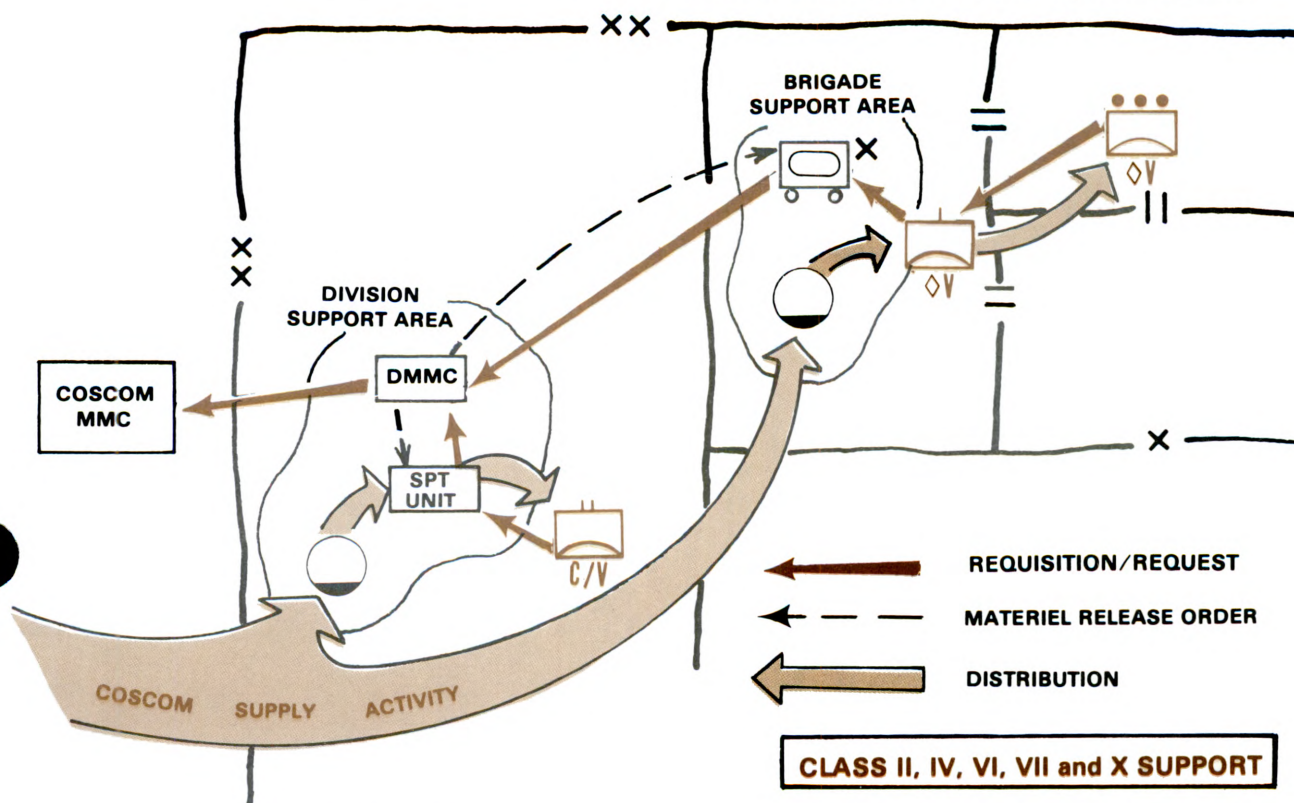
These supplies, with the exception of COMSEC materiel, are provided by the appropriate DISCOM supply element. COMSEC materiel is provided and maintained by the signal battalion. Facilities for storage of all classes of supply for which the appropriate DISCOM supply element is responsible consist of small holding areas in the division support area.

ADA batteries submit their requirements for Class II, IV, VI, VII and X items to the appropriate direct support unit who forwards them to the DMMC. The DMMC will either issue from division stocks or forward the division requirement to corps supply units.



The corps support supply installation delivers Class II, IV, VI, VII, and X supplies to division holding areas in the division support area, or, where appropriate, directly to the requesting

unit. Unit distribution of fast-moving items is normally made directly to the requesting units or to the forward distribution point of the appropriate division supply element operating in the brigade support area. The items are then issued to the requesting units.



CLASS III SUPPLIES

The C/V battalion S4 submits a periodic bulk POL forecast to the DMMC indicating any change to the previously experienced consumption rates. The DMMC forwards the division's consolidated forecast to the appropriate corps support command (COSCOM). **These forecasts provide the basis for corps and division level stockage. A formal request from the using unit is not required.** Normally, empty fuel tankers or containers presented at any distribution point are sufficient to obtain POL.

Factors influencing procedures for Class III distribution to the division include the tactical situation, availability of Class III

supplies, distribution point locations, unit locations, unit missions, and availability of tankers. The resupply objective is to provide responsive support by eliminating duplication of effort, bypassing intermediate supply points whenever possible, and preventing overload of using unit logistical capabilities.

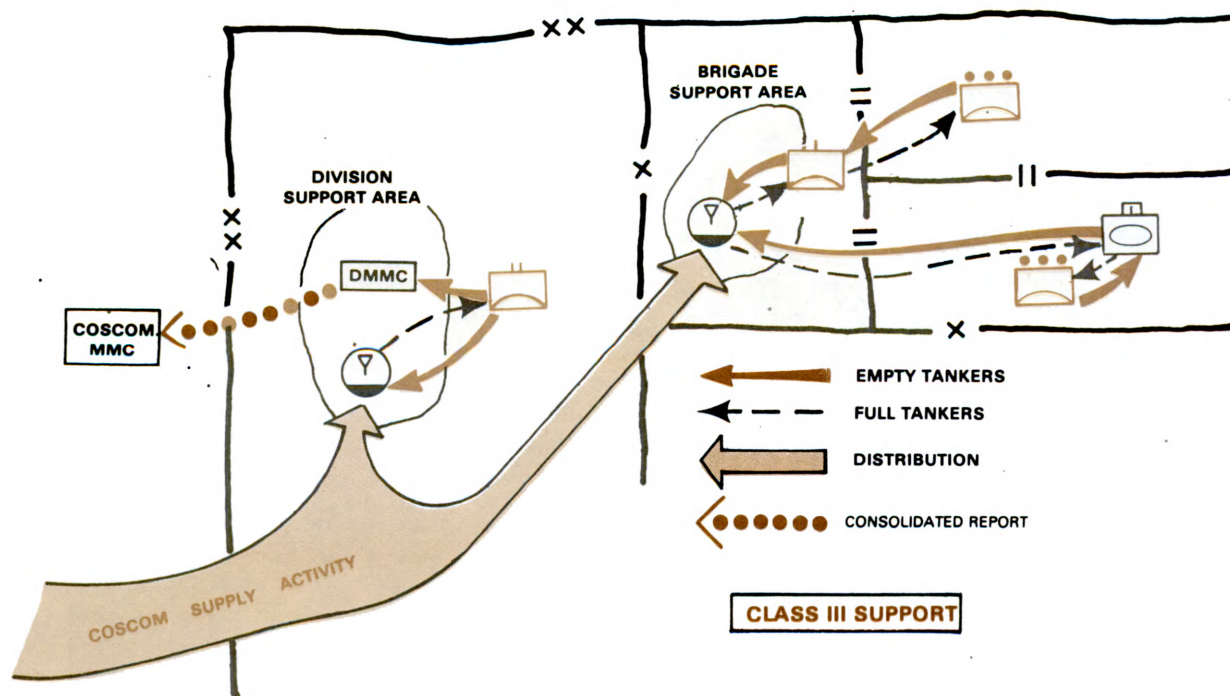
Corps tankers transport bulk Class III from corps distribution points to division main and forward distribution points. In addition, empty division tankers go to a corps Class III distribution point to transport fuel to division main and forward distribution points. **Normally, using unit tankers refill at division Class III distribution points.** Class III distribution points at all

levels also establish filling stations to refill individual vehicles on an as required basis.

Supply point and unit distribution are the primary methods used to provide C/V battalion vehicles with fuel. **Normally, the batteries will send their assigned tankers to the closest division Class III supply point for bulk supplies. Whenever possible, tactical vehicles are refueled in an assembly area prior to deployment.** When weapon systems are deployed, refueling operations are done during hours of darkness or reduced visibility whenever possible to help prevent

compromise of weapon location. Support-type vehicles are usually refueled by going to the appropriate battery tanker or to division POL supply points.

The physical location of a platoon assigned a mission away from its parent battery may make it practical to attach a battery tanker to that platoon. Vulcan platoons supporting a maneuver company team may be refueled by tankers belonging to the company team. Likewise, a battery tanker attached to such a platoon may be used to help refuel that company team's vehicles. **In either case, coordination with the supported unit is essential.**



CLASS V SUPPLIES

Class V supplies are not normally provided by the DISCOM. **Corps provides ammunition supply points (ASPs) for the division. However, the division ammunition supply officer (ASO), located in the DMMC, authenticates all ammunition requests and thus controls the flow of ammunition.** The ASO establishes control point(s) along the main supply route(s) for coordination, control, and authentication of

ammunition requests and supplies. Control points are established to provide easy access by using units.

Ammunition is normally provided by supply point distribution. The following procedures apply to C/V ammunition supply:

■ Battery and platoon ammunition vehicles proceed individually or collectively to the ASP, stopping first at an ASO control point for authentication of ammunition

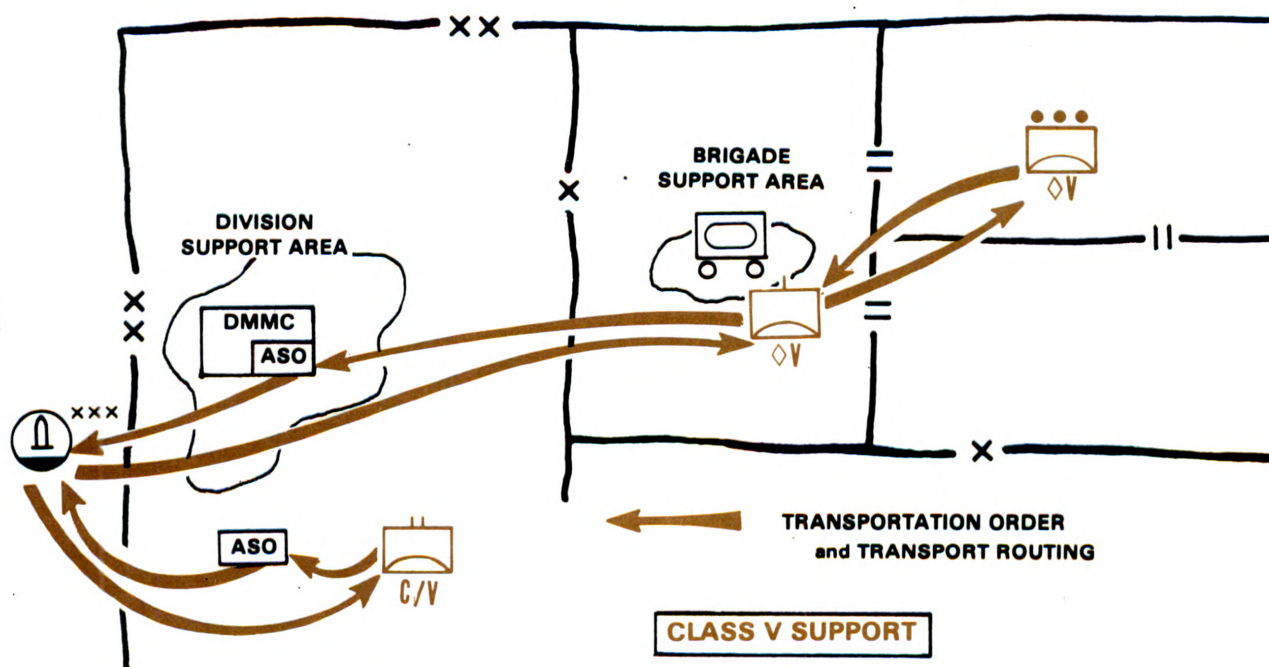
requisitions. The ammunition vehicle of a Vulcan platoon supporting a maneuver battalion may move with supported unit Class V vehicles.

■ The normal basis for approval of the requisition is replacement of expenditure from the basic load of ammunition and the announced available supply rate determined by the division G3 expenditure estimates. Specific controls are instituted to monitor and fill requests in excess of the basic load.

■ Once requisitions have been authenticated, battery ammunition vehicles

go to the corps ASP for issue of ammunition. Chaparral missiles are normally obtained from the corps special ammunition supply point (SASP).

■ Ammunition vehicles most often deliver Class V supplies directly to the using weapons system at their firing locations. Sometimes, in a fluid situation, it may be advisable to prestock ammunition. This is especially true when Vulcan platoons are supporting maneuver units in the defense. In this case, Vulcans move to the prestock point for ammunition as needed.



MAINTENANCE, RECOVERY, AND REPAIR PARTS

Direct support maintenance for all equipment in the C/V battalion except COMSEC, medical, light textiles, and ammunition is provided by the DISCOM maintenance battalion. The battalion also provides technical assistance, quality assurance, and repair parts (CLASS IX) supply.

A DS forward support maintenance company is located in each brigade trains area. This company is tailored with

elements of other DISCOM companies to provide the full range of direct support maintenance. The basic maintenance concept calls for repair and recovery as far forward as possible. To accomplish this, *the ordnance missile support company provides contact teams to the DS maintenance company for its support of the Chaparral, Vulcan, and FAAR systems* when they are operating in the brigade areas. C/V battery-level maintenance is limited to organizational maintenance services, minor repairs, recovery, and evacuation. Any repairs above

this level are performed by the DS maintenance unit in the brigade trains area or DSA.

Recovery of disabled vehicles is accomplished by the battery maintenance section by towing the vehicle to a place where it can be repaired. If the vehicle cannot be repaired at organizational level:

■ It is repaired on site by a DS maintenance contact team,

OR

■ Moved to a collection point operated by the DS maintenance company.

Equipment which cannot be repaired by organizational maintenance or by a DS maintenance unit will be evacuated to the appropriate collecting point. The equipment will then be replaced from the support company's stock of maintenance floats. If a float is not available, the battalion S4 requisitions a replacement from the DMMC.

Direct support maintenance of COMSEC equipment, medical equipment, and ammunition is provided as follows:

- **COMSEC**—the division signal battalion.
- **MEDICAL**—the COSCOM medical units.
- **AMMUNITION**—COSCOM ammunition companies.

MEDICAL

Medical support within the division is designed to either rapidly restore the

patient to duty or to prepare him for further evacuation. Patients are normally evacuated from forward areas by higher echelon medical units. Elements of the division medical battalion provide support to all assigned and attached units. *Although the medical battalion supports the three brigades by placing a medical company in each brigade area, medical service is also on an area basis.*

EXAMPLES

■ A Vulcan crewman wounded while his platoon is supporting a company team would probably receive first aid from the company aidman and would be evacuated by ambulance to the brigade clearing station or the COSCOM medical facility supporting the division; or, if necessary, evacuated by air ambulance provided by the corps-level medical brigade.

■ Similarly, anyone from any unit injured in the vicinity of the C/V battalion aid station would be processed by that station and evacuated, if necessary, to the nearest division clearing station.

The battalion aid station replenishes its Class VIII medical supplies by informal requests sent to the supporting medical company by ambulances evacuating patients. The medical company, in turn, forwards unfilled requests and requests for its own supplies to the division distribution point; the medical company does not consolidate supply requests. Medical supplies are dispatched to the battalion aid station by ambulance, truck, or aircraft.



APPENDIX A

RECONNAISSANCE, SELECTION, and OCCUPATION of POSITION (RSOP)

Units of a Chaparral/Vulcan battalion will be continually moving. They will have to move—

- To support maneuver elements.
- In response to changes in missions.
- In connection with movement of any unit being defended.
- To provide defense of march columns.
- To counter attempts at air defense suppression.

Since C/V units are most often employed as batteries and platoons, the reconnaissance, selection, and occupation of positions will normally be accomplished at battery and platoon level. The RSOP procedures discussed herein are not applicable to Vulcan units supporting maneuver elements in contact or moving to contact with the enemy. They apply to batteries and platoons engaged in the defense of other division assets. C/V units may conduct RSOP to—

- Assume a mission. The unit or asset to be defended may already be in position, or it may occupy the position after the C/V unit establishes its air defense of this position.
- To continue the same mission. The unit being defended moves to a new position; the C/V unit also moves and reestablishes its defense at the new position.

In any event, close coordination between the C/V unit and the defended unit is required throughout the RSOP sequence. In many instances, the C/V battery or platoon will be conducting the reconnaissance, selection, and occupation of position with the defended unit and will provide air defense for it during the move to the new position.

The time available for RSOP, as well as the circumstances under which it is being conducted, vary considerably. The sequence of events and the basic procedures discussed herein will, however, remain essentially the same for any RSOP.

THE RSOP SEQUENCE

Issue the warning order.
 Plan the defense.
 Plan the reconnaissance.
 Issue orders to the units or individuals concerned.
 Make reconnaissance and select positions.
 Plan the occupation.
 Prepare the position for occupation.
 Move the units to the selected positions.
 Occupy, organize, and improve the positions.



Positions selected on the map are confirmed by ground reconnaissance.

ISSUE THE WARNING ORDER

Members of the unit should be notified as soon as possible so they can begin preparation for the move.

PLAN THE DEFENSE

The positions of weapon squads are determined in designing the defense. These positions are plotted on a map and represent the best locations for defense, considering the employment guidelines (as discussed in chapter 6) and the nature of the terrain insofar as can be determined from the map. After the weapon positions have been plotted on a map, positions for battery and platoon command posts and primary and alternate routes to these positions are selected and plotted. Positions must be confirmed by ground reconnaissance and may vary within narrow limits from positions selected by map reconnaissance.

PLAN THE RECONNAISSANCE

Plans can be made for the conduct of the ground reconnaissance to include routes, release points, assembly points, and assembly times for the reconnaissance party. If time is limited to the extent that the units must move up before the reconnaissance party returns, road guard positions are selected and the necessary personnel for these jobs are included in the party.

Actual inspection of the chosen routes and positions on the ground is necessary to prove out selections made from the map or to make necessary change in plans.

The commander selects personnel and equipment to accompany him on the reconnaissance and assigns tasks to the reconnaissance party personnel. The unit SOP will establish the normal composition of

the party and assign responsibilities. The party should include the platoon leader or platoon sergeant, and a representative of each squad.

ISSUE ORDERS TO THE UNITS OR INDIVIDUALS CONCERNED

Before departing on reconnaissance, the commander or platoon leader briefs the next in command. Information covered shall include, but is not necessarily limited to, the following:

- Tactical situation.
- Location of new position area.
- Route that reconnaissance party expects to follow.
- How orders for the movement to the position will be given.
- Who will control the movement.
- How the route will be marked.
- Order of march, if at variance with the SOP.
- Estimated time of displacement.

MAKE A RECONNAISSANCE AND SELECT POSITIONS

Selection of the platoon command post and weapon positions is normally done by platoon leaders subject to the battery commander's approval. Initial positions plotted during the map reconnaissance should be adhered to as closely as possible. Squad representatives reconnoiter the positions assigned to their weapons, select tentative locations for the weapons and observation posts, and submit these locations to the platoon leader for approval. The platoon leader reconnoiters the platoon area and selects the site for the platoon command post. If time permits, he visits each proposed weapon position and supervises and assists the squad representative. After approving the weapon locations, the platoon leader informs the battery commander or

battalion S3, as appropriate, of the weapon and platoon command post locations.

Positions selected must be the best available for fields of fire, communications, accessibility, and survival. *Specific characteristics that must be considered in selecting sites* for command posts and weapons *are as follows*:

■ BATTERY AND PLATOON CPS—

- Centrally located in respect to battery and platoon units.
- Cover and concealment available.
- Sufficient area for dispersion.
- Alternate entrance and exit routes.
- Defendable against ground attack.
- Communications with higher, lower, and defended units.

■ WEAPONS SQUADS—

- Primary and secondary fields of fire/observation must be clear; 6,400-mil field of fire/observation is desired.
- Clear radio communication with platoon command posts, all other squads in platoon, and FAAR.
- Good access and exit routes.
- Defendable against ground attack.
- Must be within stated distance (SOP) of plotted positions in original defense design (e.g., 100 meters for Vulcan; 300-400 meters for Chapparral).
- Maximum use of available cover and concealment to facilitate camouflage.

The firing signature of the Chaparral and Vulcan can be expected to disclose the weapon's position during each engagement; therefore, frequent shifting of position is required. Primary, alternate, and supplementary positions must be selected during the ground reconnaissance. Routes

into and out of these positions must also be selected and prepared as necessary.

PLAN THE OCCUPATION

As soon as command post and weapon positions have been selected, the battery commander and platoon leaders plan the occupation of these positions. These plans should include—

- Routes for movement to the battery or platoon area.
- Order of march of unit during displacement.
- Release points for headquarters elements and weapons.
- Number of guides required and points where incoming units will be met by guides.
- Exact location of message center, mess, maintenance, ammunition storage, and vehicle routes within the battery or platoon area.
- Exact locations of weapon, prime mover, squad leader's command post, and observer post.
- Concealment, camouflage, and cover at command posts and weapon positions.
- Alternate weapon positions.
- Security during the move and occupation.

Security after the occupation.

PREPARE THE POSITION FOR OCCUPATION

The extent of preparation that can be made before occupation of positions depends on time, personnel, equipment, and materials available. Preparation should always include marking the location of each major piece of equipment at all positions and familiarization of guides with the routes into the positions. As circumstances permit, prepare range cards for Vulcan primary and alternate weapon positions.

MOVE THE UNITS TO THE SELECTED POSITIONS

The convoy commander would displace the unit and road march it to the new location according to procedures that are outlined in local SOPs.

OCCUPY, ORGANIZE, AND IMPROVE THE POSITION

The occupation of position should be coordinated with the supported unit to avoid mutual interference. When the battery or platoon arrives at the position area, all vehicles should be moved off the road into the position area without halting and without closing the interval between vehicles. A guide should lead each vehicle to its predetermined location. Equipment should be unloaded quietly, and in an orderly manner.

The displacement and occupation should be accomplished as rapidly as possible to minimize the time that weapons are out of action. When occupying platoon positions, first priority should be given to emplacing weapons and bringing them to a ready-for-action condition. When all weapon squads have reported that they are ready, the platoon leader will report the platoon ready for action.

Squad leaders establish certain priorities for the improvement of positions. The normal sequence is as follows:

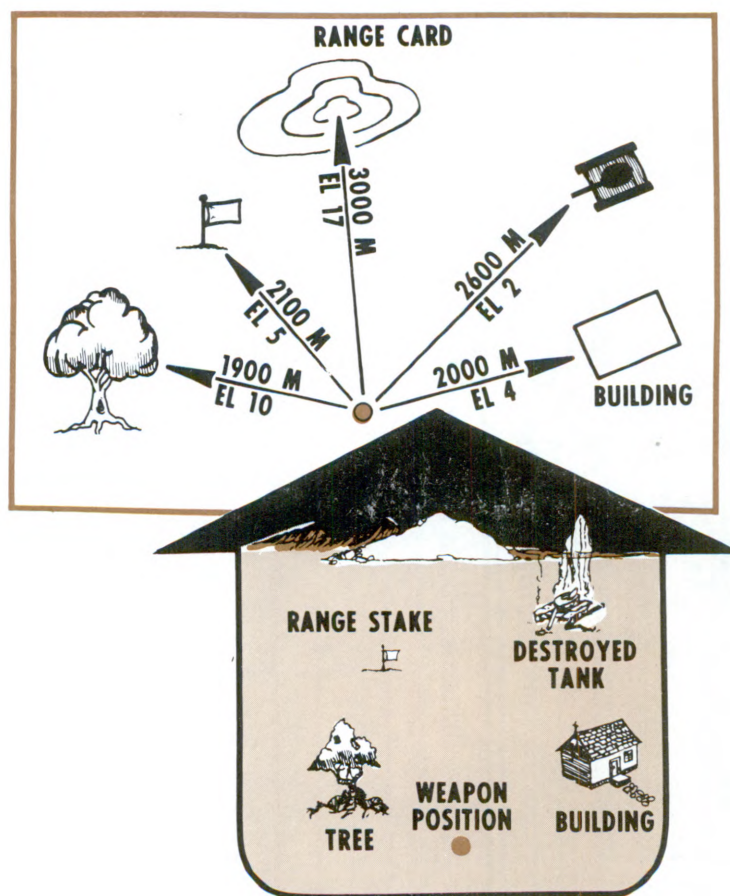
- Natural camouflage is supplemented where possible, using artificial materials, such as garnished nets.
- Personnel prone positions are prepared at the earliest possible opportunity and replaced by foxholes and dugouts as time permits.
- Chaparral and Vulcan are protected from blast, fragmentation, and small arms fire by digging in or constructing revetments. Care must be

taken to insure that revetments do not impede full employment of the weapons.

■ Ammunition must be protected by being dug in or revetted and protected by overhead cover.

■ Work on alternate and supplementary positions is initiated as early as possible to expedite displacement in the event the primary position becomes untenable.

Upon occupying a position, a battery commander or platoon leader must provide for local security. Measures taken should be integrated with the ground defense plan of the supported unit. If time permits, the platoon or squad leader should construct range cards for each crew-served weapon that can be used in ground defense. These cards should indicate ranges to critical points on all likely avenues of approach.



APPENDIX B

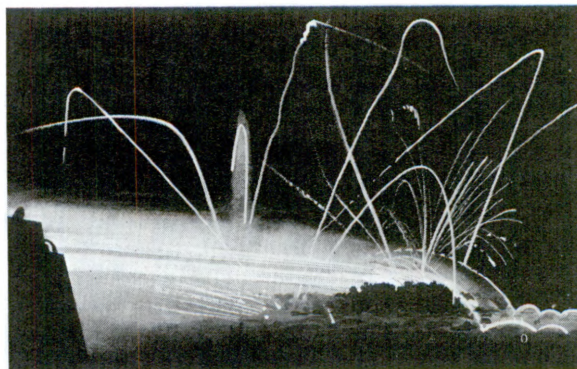
NIGHT OPERATIONS

This appendix discusses the operations of Chaparral and Vulcan units during the hours of darkness.

Reduced visibility limits the effectiveness of both the air attacker and the air defender.

Reduced visibility during the hours of darkness *will limit the intensity and effectiveness of enemy air attack.* Even with good visibility, the use of low-level attack profiles by Threat aircraft poses difficulties for the pilot in enroute navigation and target acquisition. Without it, these difficulties are compounded. The possible use of sophisticated navigational and night vision devices by Threat aircraft notwithstanding, a lower level of air activity can be expected. This is particularly true in the forward area where frequent movement of forces complicates the enemy's target acquisition effort.

Darkness also degrades the effectiveness of Chaparral, Vulcan, and Redeye. *Although aircraft can be detected and acquired* through such means as radar warning, engine sounds, moonlight, reflected light, and engine exhaust flames, **ranging and making positive identification are very difficult.** Temporary night blindness caused by firing of weapons further handicaps weapon crews conducting engagements at night.



Vulcan Tracers.

As a general rule, Chaparral/Vulcan squads and Redeye teams in the forward area should not engage an aircraft at night unless the aircraft is attacking the defended asset or the weapon itself.

Tell-tale missile signature and Vulcan tracers may disclose the location of friendly units to enemy aircraft, or they may subject the defended area to close scrutiny by enemy intelligence means. This may, in turn, result in an attack by the aircraft fired upon or lead to later air, field artillery, or ground attacks on the units or other assets being defended. This possible compromise of security, along with the identification and engagement problems with short-range weapons at night, normally dictates that fire be withheld unless an aircraft is actually attacking the weapon or the asset being defended.



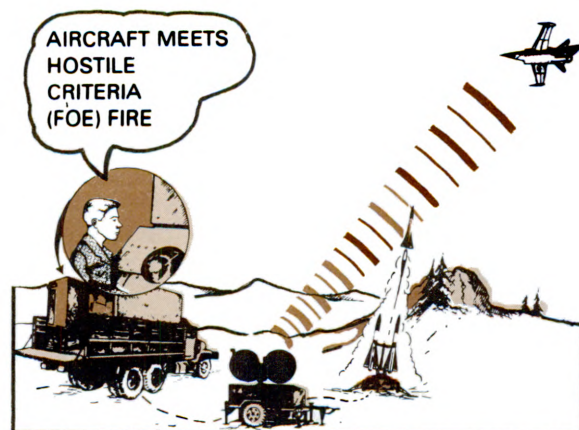
Missile Signature.

If an aircraft does attack, short-range weapons should shoot back because:

- The aircraft has obviously located his target already.
- The right of self-defense authorizes weapon crews to engage the aircraft.
- Although the probability of destroying the aircraft may be low, the 20-mm tracer streams of Vulcan and the missile signatures of Chaparral and Redeye may diminish the effectiveness of the attacker by causing him to either abandon his mission or err in the delivery of his ordnance.

Our forces must rely primarily on the radar-directed, all-weather Hawk and Hercules missile systems to provide air defense at night.

The need for aircraft to fly higher at night to avoid terrain makes them better targets for the low- and medium-altitude *Hawk* and the high-altitude *Hercules* systems (ADA principle of mix).



Hawk and Hercules systems don't need to visually acquire and identify an aircraft to engage it.

Since participation in the air battle for Chaparral, Vulcan, and Redeye will be reduced at night, commanders should take advantage of this lull and the concealment afforded by darkness to:

- Move weapons to new, alternate, or supplemental positions.
- Improve positions.
- Resupply weapons and crews (ammunition, POL, rations, etc.).
- Perform required maintenance.
- *Allow maximum crew rest* by lowering the alert state for teams, squads, and platoons.

The reduction in Threat air activity may also permit:

- Positioning of weapons that provides better security against ground attack.
- Use of Vulcan in defense against ground attack, dependent upon the criticality of the situation and the availability of ammunition.



APPENDIX C

VULCAN in the GROUND SUPPORT ROLE

The Vulcan weapon is well suited to providing ground fires. Its accuracy, high rate of fire, mobility, and lethal 20-mm high-explosive rounds make the cannon effective against troops, lightly armored vehicles such as the BMP personnel carrier, and wheeled vehicles. When supporting mechanized forces, Vulcan can be particularly effective in suppressing Threat antitank guided missile (ATGM) systems.



REFERENCE

Detailed procedures for engaging ground targets are contained in FM 44-5.

When employing Vulcan units in the ground fire role, the maneuver force commander must consider the degree of

degradation in air defense support he can afford. The decision should be based primarily on the magnitude of the air versus the ground threat. Other factors he must consider are:

- The hardness of the targets Vulcan will engage.

- The vulnerability of Vulcan to automatic weapons, tanks, and ATGMs.

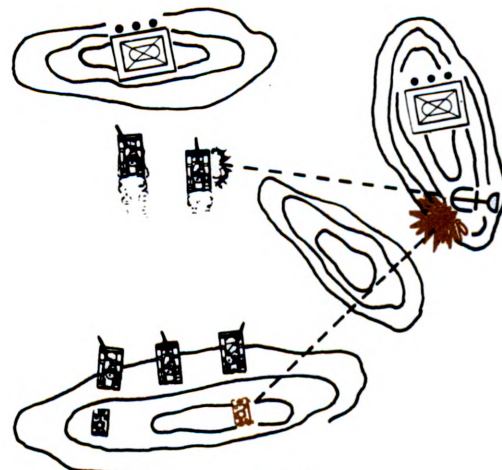
- The relatively few Vulcans available to the force.
- The availability of 20-mm ammunition.

Vulcans can be employed by the force commander in these roles:

- **Perimeter defense**
- **Supplemental ground fire support**
- **Dedicated ground fire support**

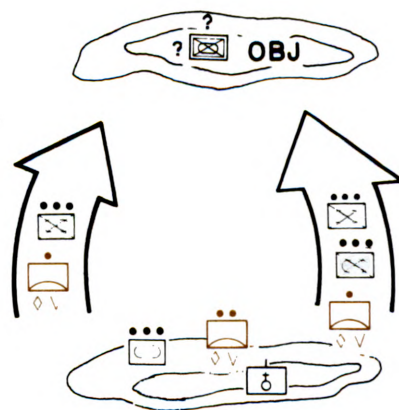
When a Vulcan unit is allocated to provide air defense for a unit or asset, its *weapons can be integrated into the perimeter* of that unit *during hours of darkness or periods of poor visibility*. For example, a Vulcan platoon providing a portion of the air defense for the division main CP may provide defense against ground attack at night as a part of the perimeter defense. This method of employment will have little, if any, adverse effect on the air defense mission.

When Vulcan weapons are providing air defense of maneuver units, they are positioned where they can best provide that air defense. During the battle, however, *Vulcan may be utilized to suppress targets which other weapons, because of terrain or the situation, cannot.* In this case, the commander of the supported unit, normally the company team, may direct a Vulcan to engage a ground target while continuing to provide air defense overwatch. If an air threat appears, engagement of aircraft takes priority over the suppressive mission.



Supplemental Ground Fire Support.

Vulcan units can be used in a dedicated ground fire support role. In this role, the air defense mission becomes secondary. Because this significantly degrades the air defense capability of the division, the *division commander will normally retain* at his level *the authority to direct this method of Vulcan employment.* When used in this role, Vulcan units will be released from their air defense alert requirements; will normally be attached to the unit they are supporting; and will be positioned where they can best provide ground fire support.



Positioning for Dedicated Ground Fire Support.

When the employment of Vulcan in the ground role is anticipated, a determination of the type of ammunition with which the weapon is to be loaded *must be made*. In making this decision, the commander should consider the following:

■ The availability of the two types of ammunition—point detonating, self-destruct designed for use in the aerial role and point-detonating designed for use in the ground role.

■ The maximum effective direct-fire range of the Vulcan cannon is about 2,200 meters. Aerial fire ammunition detonates at tracer burn-out 3 to 5 seconds after firing, at ranges averaging 1,600 to 2,200 meters (depending on the elevation of the cannon at firing). Aerial fire ammunition will, therefore, be effective against most ground targets.

■ The self-destruct feature of aerial fire ammunition significantly improves

the Vulcan's capability against aircraft. Ammunition without this feature (point-detonating only) is much less effective and may pose a danger to friendly forces upon impact with the ground.

■ Changing to nonself-destruct, point-detonating ammunition requires **up to 30 minutes** with the *vehicle stopped* and the *back ramp open* in the SP Vulcan. (The change of ammunition can be made in 1 or 2 minutes in the towed Vulcan.) Unless they fire the rounds already in the drum before reloading, the SP Vulcan crew will have up to 1,000 rounds of unlinked ammunition on hand. Relinking this ammunition is a very time-consuming process.

Considering the above factors, loading with aerial fire ammunition is usually favored—except when this type of ammunition is in critically short supply and when Vulcan is to be used in a dedicated ground support role.



APPENDIX D

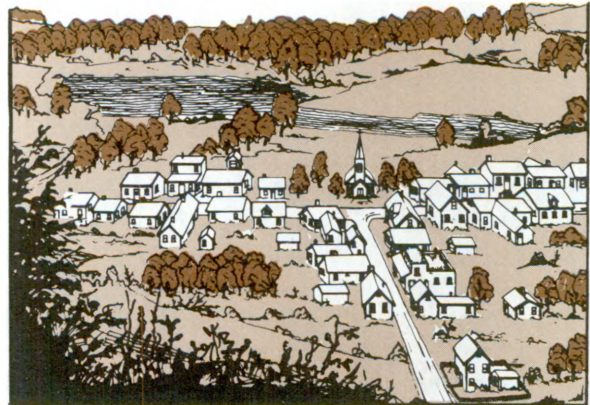
SPECIAL TACTICAL OPERATIONS

This appendix addresses Chaparral/Vulcan support of operations in built-up areas and river crossing operations. Although categorized as special operations because of the manner in which they are planned and conducted, these operations are commonplace and C/V units supporting maneuver forces can expect to be frequently involved in them.

BUILT-UP AREAS

Many areas of the world, especially Western Europe, have experienced massive growth in built-up areas and manmade changes to the natural landscape. These changes significantly affect potential future battlefields. Avoidance of built-up areas is no longer possible. Rather, military operations in built-up areas are an integral part of combat operations. Built-up areas and manmade changes to the terrain take a variety of forms. New highway systems have opened up areas previously considered unsuitable for fast-moving operations. Major cities have lost their well-defined nature and have spread out over the nearby countryside and into the suburbs. Highways, canals, and railroads have been built to connect population centers and have, themselves, attracted industries and directed urban growth into strip cities.

Task forces will most often encounter small villages and strip areas. The town and small city will impact on the operations of brigades and divisions. Large cities or major urban complexes will require operations at division or corps level. The battalion task force can normally expect to operate in these two areas as part of a larger force.



The defender has the advantage in the use of built-up areas. He has superior protection, which is readily available, as well as concealment and covered routes of movement within the area. On the other hand, the attacker can isolate and bypass some built-up areas but will be required to attack others. He is then faced with fighting from the outside into a well-defended position. Both attacking and defending forces will take advantage of the cover and concealment offered by built-up areas to locate command posts, stocks of supplies, and combat service support units.

CONTENTS

	PAGE
Built-Up Areas	D-1
River Crossing	D-3

REFERENCE

A detailed explanation of military operations in built-up areas is contained in FM 90-10.

Urban combat is normally characterized by:

- Reduced mobility.
- Instant fortified positions.
- Restricted observation.
- Reduced range or lethality of weapons.
- Reduced range of radars.
- Increased problems of civilian control.
- Reduced effectiveness of reconnaissance and surveillance sensors.
- Complicated command and control procedures.

Cover and concealment offered by built-up areas will greatly aid passive air defense measures, not only from visual reconnaissance, but also from infrared sensors. Sensor returns will be so numerous due to fires and normal heat sources associated with cities that interpretation will be difficult. Side-looking airborne radar will be degraded by the masking effect of buildings. Overhead aircraft reconnaissance will be vulnerable to concealed C/V weapons, Redeye, and small arms.

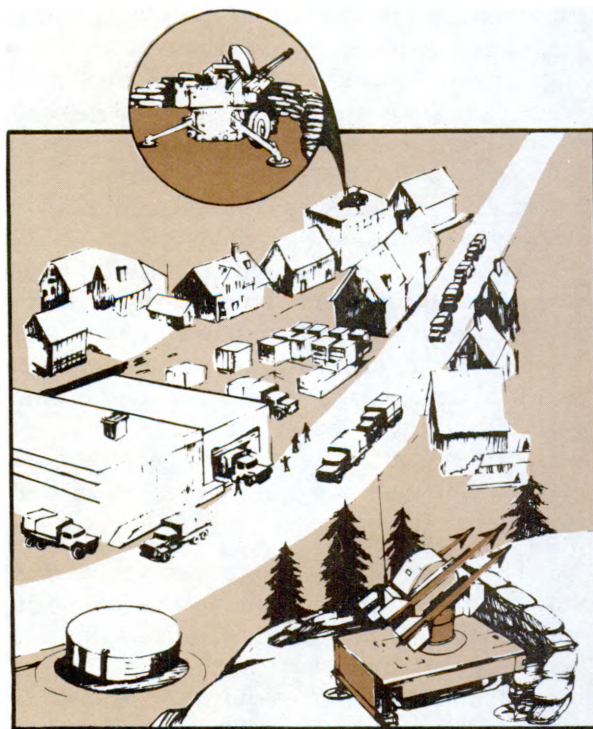
The *same Chaparral/Vulcan employment considerations that apply to normal operations usually apply to built-up areas*. Problems that affect C/V employment will be:

- Locating and occupying suitable firing positions.
- Moving of weapon systems.
- Providing security for isolated firing positions.
- Buildings degrading early warning, target acquisition, and identification.

Positioning of Chaparral and Vulcan weapons in built-up areas will often be limited to more open areas such as parks,

fields, and rail yards. Chaparral and Vulcan effectiveness is limited when excessive masking exists. *For the most part, C/V units will defend maneuver elements and other critical assets that are located in relatively open portions of the built-up areas and vulnerable to air attacks.*

If need be, towed Vulcan and Chaparral (separated from its prime mover) may be emplaced by helicopter on rooftops in heavily built-up areas to provide protection against air attacks from all directions. This should be accomplished only when justified by the proposed length of occupation of the area and/or enemy air threat.



The Redeye section provides protection for battalion task forces and field artillery battalions as in any other operation. When employed within the built-up area, rooftops usually offer the best firing positions. Heavy machineguns emplaced on rooftops provide additional air defense.



Hawk missile units provide air defense coverage for the force from positions located outside the built-up area.

FM radio communications may be degraded by buildings. Use of wire, FM relays, and HF/SSB radios can help overcome line-of-sight communications problems.

RIVER CROSSING

A river crossing operation is a special operation in that it requires detailed planning, specialized support, and centralized control to effect the crossing. It is normally conducted by a division or corps. Battalions and brigades usually cross as elements of the larger force. When they are conducting independent operations, their crossings require similar planning, support, and control.

A force's tactical mobility must be sustained to win. In the offense, the attacker seeks every opportunity to exploit enemy weaknesses. Breaking through an enemy's defenses and advancing to the objective cannot be delayed or thwarted by a river

obstacle. It is desirable to cross rivers without delay by conducting a ***hasty crossing***. When the obstacle or enemy combat power precludes a hasty crossing, a ***deliberate crossing*** is conducted to overcome the obstacle and/or the enemy. In the defense, the force may be pressured to retrograde to new defensive positions before resuming the offense. The ***retrograde river crossing*** is conducted with the same planning detail of a deliberate crossing because of the enemy's superior combat power.

The objective of any river crossing is to EFFECTIVELY move a force across a major water obstacle.

A hasty river crossing is a planned operation and is preferred over a deliberate crossing. It is feasible when:

- Enemy defenses are weak or can be overcome by fire.
- Maneuver forces are equipped to rapidly advance, cross, and continue the attack.

It is characterized by:

- Detailed planning and control.
- Speed and surprise.
- Minimum loss of momentum.
- Minimum concentration of forces, hence less vulnerability.

A hasty crossing does not require that all enemy forces be cleared from the river line. It capitalizes on the enemy's confusion and lack of sufficient combat power to oppose the crossing.

A deliberate river crossing is required when a hasty crossing is not feasible, has failed, or when offensive operations commence at the river line.

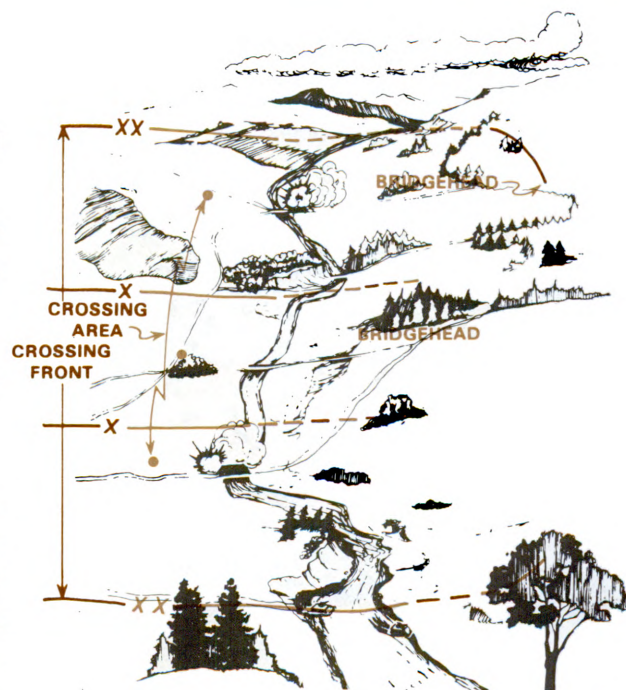
It is characterized by:

- Detailed planning and centralized control.
- A deliberate pause short of the entry bank to prepare and build up combat power.
- Concentration of combat power.
- Clearance of enemy forces from the river line.

To reduce congestion, *numerous crossing sites along a broad front are desirable*. The characteristics of the obstacle and the amount of crossing equipment available dictate the number of sites. If there are no fording sites across the water obstacle, vehicles cross by "swimming," rafting, bridging, or tactical aircraft and helicopters. The routes of access and egress, the slope and stability of the river banks, and depth and velocity of the water all impact on the requirement for support equipment, site preparation time, and the number of feasible crossing points.

In planning a river crossing operation, the force commander identifies a bridgehead, an area on the enemy side of the water obstacle that is large enough to accommodate the majority of the crossing force, has adequate terrain to permit defense of the crossing sites, and provides a base area for continuing the attack. The bridgehead line is the outer limit of the bridgehead and is tied in with the left and right flanks of the crossing front. Once the bridgehead is secure, the river crossing operation is terminated.

Assault forces are the major subordinate units conducting the assault to, across, and beyond the water obstacle. In a division crossing, for example, the brigades are the assault forces.



Forces conducting river crossing operations are particularly vulnerable to enemy air attack because of:

- Restrictions on the movement of the attacking ground forces.
- The buildup or concentration of men and materiel prior to the crossing.
- The exposure of personnel and equipment to enemy observation while crossing the river.
- The difficulty and delay encountered in moving heavy and bulky combat equipment across the river to support the assault force.
- Natural avenues for low-altitude air attack the river may afford.

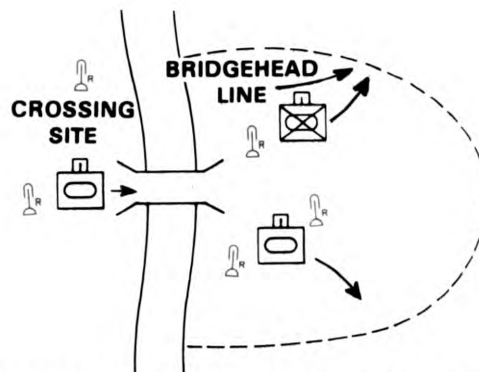
Because of this vulnerability of forces and the criticality of the crossing to the success of the overall offensive operation, *air defense priorities within the organization will normally be focused on the crossing operation*. Local air superiority over the crossing and bridgehead areas should be obtained. A mix of ADA weapons is employed in mass to limit or deny entry by enemy aircraft into the area.

Close coordination between Air Force counterair and close support operations, Army aviation activities, and ADA support is essential. **ADA should be allowed maximum freedom to engage enemy aircraft intruding into the airspace over the crossing area.** For example, with the approval of higher air defense authority, a WEAPONS FREE control status might be established for jet aircraft on certain headings in the crossing area.

If multiple crossing sites are available and used, the vulnerability of the force as a whole to air attack is reduced. **With multiple crossing sites, the commander establishes an order of air defense priority based on the criticality and vulnerability of the forces crossing at each site. ADA resources are then allocated to the assault forces and crossing sites based on their relative priorities.** Chaparral and Vulcan weapons are employed in battery and platoon strength to obtain the necessary mass. If a division is conducting the crossing as part of a corps operation, nondivisional C/V units may augment divisional ADA.

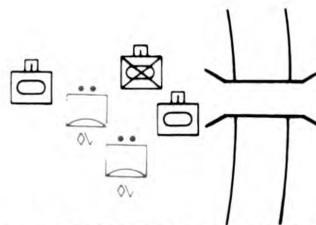
All ADA systems supporting the river crossing operation are coordinated and integrated. The basic procedures for support of hasty and deliberate crossing are much the same; the timing of events may vary depending upon the type of crossing being conducted. **The general sequence of actions and method of employment of each of the ADA systems that may be available to a division is as follows:**

Redeye teams accompany and support company teams of battalion task forces making the assault. Redeye teams defend the crossing site while the battalion task force crosses, then shifts priority back to the support of company teams in the bridgehead.

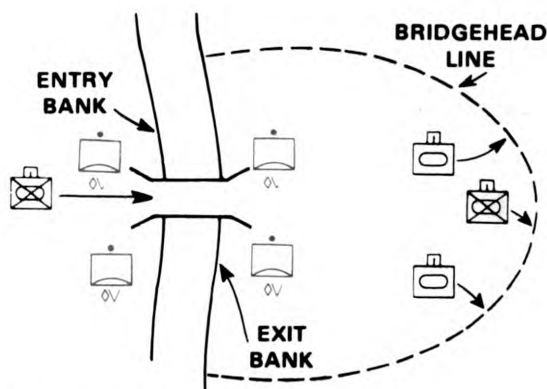


REDEYE ACCOMPANIES COMPANY TEAMS OF THE BATTALION TASK FORCES MAKING THE ASSAULT.

SP Vulcan guns are deployed well forward in the formations of assault units and initially provide coverage of crossing sites from positions along the entry bank. When the assault forces have secured the exit bank, Vulcan squads cross the river by the most expeditious means and take up positions near the crossing site. A stationary asset defense is established for the crossing site.

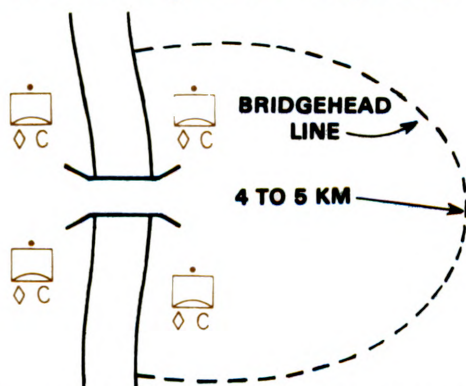


INITIALLY, VULCANS PROVIDE COVERAGE FROM THE ENTRY BANK.



AFTER THE EXIT BANK IS SECURED, VULCAN SQUADS TAKE UP POSITIONS NEAR THE CROSSING SITE.

In a deliberate crossing, *Chaparral* should be deployed well forward initially to protect the force as it moves to positions and concentrates near the entry bank. As soon as the bridgehead has been expanded sufficiently to allow siting of Chaparral within it (4-5 kilometers), Chaparral squads cross the river and take up the defense of the crossing site. SP Vulcan can then either remain at the crossing site forming a gun-missile defense or it may rejoin and support maneuver elements as they conduct offensive operations to expand the bridgehead.



WHEN BRIDGEHEAD HAS EXPANDED, CHAPARRAL IS EMPLOYED IN A STATIONARY ASSET TYPE DEFENSE OF THE CROSSING SITE.

In a hasty crossing, Chaparral may be positioned farther to the rear protecting control and support elements, but provisions should be made to move Chaparral units forward early so that they are prepared to assume the defense of crossing sites once assault forces have expanded the bridgehead.

If divisional ADA is augmented with towed Vulcan, these weapons are normally used with Chaparral to provide mixed defenses of the highest priority crossing sites.

Hawk units are positioned well forward to provide coverage over crossing areas and the bridgehead. Hawk units are normally deployed 10 to 15 kilometers to the rear of the river line. However, if positions affording low-altitude coverage over the crossing sites

are not available at this distance, Hawk platoons will be moved forward so that this coverage is provided. The criticality of the mission normally justifies a higher risk of suppression by Threat artillery. This risk is reduced by employing these units by platoon and in battalion mass, permitting frequent movement to alternate positions while maintaining continuous coverage.

A retrograde river crossing is applicable when the enemy advances overwhelm the division, causing it to retrograde and subjecting it to an enemy pursuit. It is conducted to:

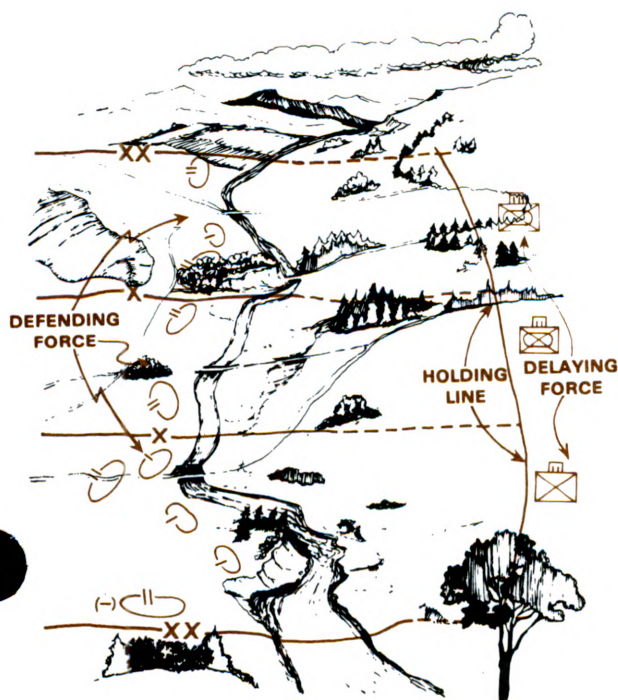
- Establish the defense on the exit bank or
- Continue the retrograde to defensive positions beyond the water obstacle.

It is characterized by:

- Detailed planning and centralized control.
- Enemy control of maneuver initiative.
- High risk to friendly forces.
- Forces on exit bank providing overwatch fires.
- Forces delaying enemy's advance to trade space for time at crossing sites.

A retrograde river crossing is conducted with the same detailed planning as a deliberate offensive crossing. Failure of the retrograde on the approach bank of the river may result in loss of the entire force. The commander must get all nonessential combat and combat service support across the river and disperse them in locations that can support the operation. The delaying force deceives and delays the enemy while a defense force is established on the exit bank. The delay force must be strong enough to hold the enemy forward of the holding line to permit remaining forces adequate time to cross and occupy new positions. The defending force on the exit bank accepts responsibility on order, for the

battle from the delaying force. The defending force then overwatches the crossing of the delaying force.



Air defense artillery units will function in a manner similar to that used in offensive crossings. However, a retrograde crossing is **not** an offensive crossing in reverse.

Hawk units move by battery and platoon echelon, establishing and maintaining

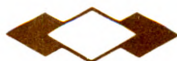
continuous coverage over both the delaying and defending forces. The last Hawk units will normally cross the river when the line of contact is within about 10-15 kilometers of the river line. As in the offense, Hawk coverage is weighted forward for protection of delaying and defending forces and crossing sites.

Initially, Chaparral will normally be defending crossing sites. As the holding line approaches within about 4 to 5 kilometers of the crossing sites, Chaparral units will cross the river and take up the defense of other priority assets, such as division control and support elements which have already crossed the river.

Towed Vulcan, if available, will normally be used to form mixed gun-missile defenses with Chaparral.

Initially, SP Vulcan accompanies and supports maneuver elements in the delaying force. Just prior to the withdrawal of Chaparral, SP Vulcan units take up the defense of crossing sites. SP Vulcan units remain in positions and cross with the last battalion in the delaying force.

Redeye teams will accompany company teams in the delaying and defending force—providing them close-in air defense protection during the retrograde operation. Redeye teams with the delaying force will normally be among the last elements to cross the river. Redeye firing positions on the entry side of the river are maintained as long as ground security allows.



APPENDIX E

AIRBORNE and AIR ASSAULT OPERATIONS

Once the force conducting either an airborne or an air assault operation is on the ground, the principles and guidelines for the employment of Vulcan are essentially the same as for other operations. The air movement and the phasing of airborne and air assault forces into objective areas will, however, affect the establishment of command and control relationships between Vulcan and supported units and have an impact on the selection of air defense priorities.

This appendix addresses special considerations applicable to each of these type operations.

AIRBORNE

The one major factor that sets airborne operations apart, as far as Vulcan employment is concerned, is the phasing of the force into the objective area. ***Command and control relationships between Vulcan and other ADA elements and supported units must be clearly defined and modified, as necessary, as the operation progresses.***

During the initial phases of a division-size airborne operation, the Vulcan battalion will usually have one of its towed Vulcan batteries attached to each of the three brigades and will retain the one remaining battery in general support. Two FAARs will normally be attached to each of the batteries with the brigades. The two remaining FAARs are kept under battalion control.

An assault echelon makes a parachute drop to secure assigned objectives and establish an airhead for the insertion of the remainder of the division. This phase is decentralized and very fluid. Redeye teams, attached to maneuver companies, provide the initial air defense.

CONTENTS

	PAGE
Airborne	E-1
Air Assault	E-2



Vulcan platoons are further attached to maneuver battalions and are inserted into the airhead at the earliest possible time. Usually, Vulcans will be airlanded along with other elements of these battalions and, along with Redeye, provide air defense for the battalions as they organize and consolidate their objectives.

After the *Vulcan battery commander arrives* in the objective area (usually along with elements of the brigade headquarters), he *establishes a command post, assumes control of his platoons, and coordinates the defense of the airhead*. He positions the two attached FAARs to provide alert warning for Vulcan and Redeye.

The *air defense support team at the brigade TOC advises* the brigade commander on air defense matters *and coordinates* with field artillery and Air Force representatives on matters concerning the use of airspace in the objective area (e.g., weapons control status for Vulcan and Redeye). This team keeps the Vulcan battery commander informed on the brigade's air defense requirements and the weapons control status as the operation progresses.

Once the assault echelon has established an airhead, the follow-up echelon, containing the remainder of combat, combat support, and combat service support elements, is inserted by air landing.

With the arrival of the division command post and *the remainder of the Vulcan battalion*, the DAME and the Vulcan battalion TOC become operational. *More centralized control is established* over Vulcan units and FAAR sections. Vulcan batteries previously attached to brigades are usually assigned missions in direct support of the brigades. The fourth battery, in general support, defends division priorities such as the landing zone, command post, and DISCOM elements. FAAR sections

are normally released from attachment to batteries and brought under the direct control of the FAAR platoon leader.

If a Hawk battalion is placed in DS of the division, it is normally air landed along with rear echelon elements and *provides low- and medium-altitude air defense of the airhead and objective area*. Control and coordination links with the Hawk battalion are established as discussed in chapter 5.

REFERENCE

Detailed information on airborne operations is contained in FM 90-12.

AIR ASSAULT



The air assault division is dependent upon its organic aircraft for the success of its operations. *In all phases of an air assault operation, aviation and aviation assets are critical to mission accomplishment*. Considering the factors of criticality, vulnerability, and recuperability as discussed in chapter 6, the commander will

usually accord air defense priority to these assets. *Typical priorities include:*

- **Aviation assets.**
- **Forward area refuel and rearm points.**
- **Aviation maintenance and support facilities.**
- **Assault landing fields.**

Often, all Vulcan weapons will be allocated to the defense of these critical assets. When maneuver elements are conducting ground combat operations in the objective area, they frequently must rely solely on organic Redeye teams, small arms, machineguns, and passive air defense measures for protection against enemy air attack.

If enemy air activity is such that additional air defense is needed, Vulcan units may be attached or placed in direct support of the maneuver force in the landing zone. When this is done, the towed Vulcans must be brought into the landing zone by medium helicopters (CH-47). Since these helicopters are in heavy demand by combat support and combat service support

units, the prime mover for the towed Vulcan will often have to be left behind. Thus, the helicopter must place the Vulcan right on its firing position and any subsequent movement to new positions or to support future operations requires additional helicopter support.

When planning air assault operations, *communications require special consideration.* The Vulcan battalion has only FM radios with the exception of one AN/GRC-106 in the battalion headquarters. Because of the potential for extended distances between the battalion headquarters and its batteries, reliance must be placed on maneuver unit command and operational nets. It also necessitates that the focal point for the dissemination of vital air defense information be the air defense member of the airspace management element in the DTOC. At this location he has access to sole user UHF circuits to the Vulcan battalion and to the brigade CPs, where air defense support teams are located.

REFERENCE

Detailed information on air assault operations is contained in FM 90-4.



APPENDIX F

SPECIAL ENVIRONMENTS

Desert, jungle, northern, and mountain operations all have one thing in common. US forces are faced with another potential enemy—the environment itself. Extreme conditions of climate and terrain may have an adverse effect on personnel and equipment. To be successful in these environments, commanders must insure:

- Personnel are properly trained and equipped.
- Equipment is modified and maintained for the environment.
- The operation is planned to the last detail, especially when forces are unfamiliar with the environment.

In these environments, the basic principles and guidelines for the employment of Chaparral and Vulcan do not change. They must, however, be adapted as required to conform with the tactics and techniques of supported units and be applied within the constraints imposed by the environment. The following field manuals describe how our forces will fight in these environments:

- FM 90-3 Desert Operations
- FM 90-5 Jungle Operations
- FM 90-6 Mountain Operations
- FM 90-11 Northern Operations

CONTENTS

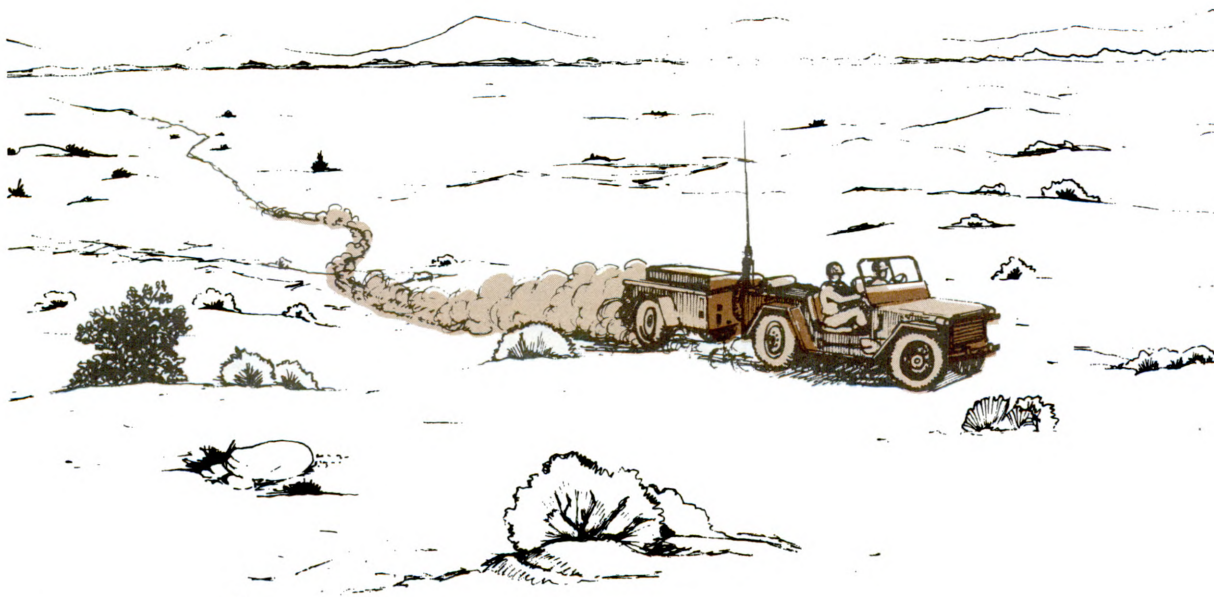
	PAGE
Desert	F-2
Northern	F-4
Jungle	F-5
Mountain	F-6

In organizing Chaparral and Vulcan units for combat in special environments, air defense priorities are developed and Chaparral and Vulcan weapons are allocated through consideration of the same factors as discussed in chapter 6 of this manual.

This appendix deals primarily with problems Chaparral and Vulcan units may encounter when operating in special environments and how these problems may be solved. Commanders must consider:

- What is the air threat?
- How is the air threat affected by the environment?
- How can the fundamentals of Chaparral and Vulcan employment best be applied?
- How does the environment affect mobility and communications?
- What effect will the environment have on maintenance procedures?
- What are the individual health requirements imposed by the environment?
- What special logistical support is required?

DESERT



Desert warfare is usually characterized by:

- Use of mobile, fast-reacting forces.
- Long fields of fire and observation.
- Dispersal of forces over a broad front and in great depth.
- Use of active deception measures.
- Scarcity of cover and concealment.

Low, flat terrain enhances both visual and radar detection of approaching aircraft. Enemy aircraft will launch many of their attacks by flying toward their targets at extremely low levels and at high speeds. This will avoid early detection and hinder friendly reaction. The success of such tactics depends on the enemy knowing where he is going and the nature of his target as his high-speed, low-altitude approach limits his observation. The lack of dominant terrain features for use as navigational aids may further limit the pilot's ability to locate his target on the first pass. A second pass by the aircraft will often be necessary. To improve his visibility, while reducing that of Chaparral/Vulcan gunners, the aircraft pilot may often attack with the sun to his back.

The biggest obstacle that must be overcome when employing Chaparral and Vulcan in the desert is the wide dispersion and fragmentation required of maneuver forces and other critical assets. While such dispersion complements passive air defense measures, it also limits the amount of active air defense that can be provided the force without the addition of reinforcing weapon systems. Therefore, selection of air defense priorities for Chaparral and Vulcan, as well as Hawk, must be carefully considered and contingency plans for rapid air defense artillery redeployment constantly reevaluated and updated.

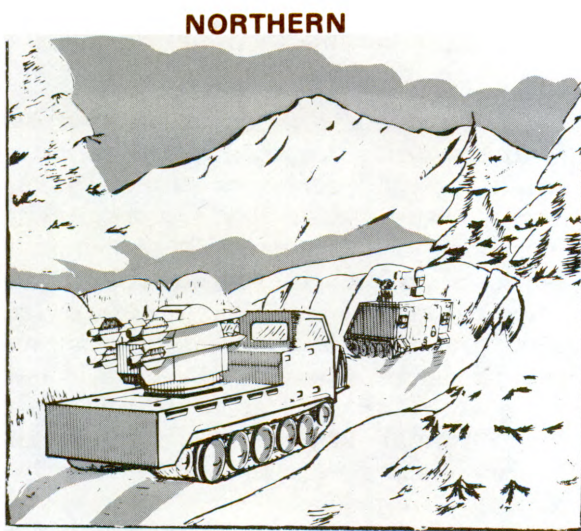
Weapons can be positioned in folds and ripples in the earth and camouflaged to prevent detection from both air and ground observation. Alternate positions must be selected and prepared as both Vulcan and Chaparral should move frequently to enhance survivability. Use of gullies for concealing weapons should be avoided as they serve as reference points for enemy observation and become rapidly flooded during cloudbursts. Camouflage discipline, to include elimination of litter and brushing out of vehicle tracks, must be strictly enforced.

Desert terrain normally poses no problems in moving and deploying Chaparral and Vulcan systems. However, routes and positions must be carefully selected because of the weight of the equipment. Daylight attacks by dismounted infantry and air assault troops are not probable; however, mounted troops present a definite threat because of the speed of movement of mechanized units in the desert. Units must be able to rapidly displace to avoid or counter the threat.

The great distances normally found between units increase the reliance on radio during desert operations. Thermal heating and "dead spots" may cause reductions in the range of FM transmitters. Electrical grounds are poor in desert terrain since the surface soil lacks moisture. This poor grounding reduces radio communications range unless a counter-poise is used. Whip antennas can lose up to one-third of their normal range in desert terrain. Therefore, complete antenna systems such as horizontal dipole antennas and vertical antennas with adequate counterpoises should be used. "Dead spot" problems may sometimes be eliminated by equipment relocation.

The desert has detrimental effects on machines. Dust and sand are as deadly to vehicles as enemy fire. Fuel, lubricants, and air intakes are easily contaminated, resulting in ruined engines and eroded components. Vehicle cooling and electrical systems are vulnerable to desert extremes of temperature. Tracks, tires, and suspension systems suffer a great deal of abuse in the desert. Sand and rocks literally grind away rubber tracks, while thorns repeatedly puncture tires. Thus, a larger supply of spare parts is required in the desert than in more moderate environments. Intense desert heat can quickly cause communications equipment to overheat and malfunction. Proper operation of equipment, as well as preventive maintenance, is required to insure effective communications.

The desert environment has a debilitating effect on troops who have not been properly acclimated or trained. Continued exposure to the sun's rays causes profuse sweating, sunburn, dehydration, cramps, feet exhaustion, and even heat stroke.



Warfare in northern areas may be characterized by:

- Use of forces dispersed in small groups over wide areas.
- Fields of fire often limited by terrain obstacles.
- Requirements for personnel and materiel to be protected against extreme cold temperatures.
- Restricted mobility with movement often being limited to inadequate road networks; movement will often be by foot and by air.

Conditions of weather and terrain in northern areas, which tend to restrict movement on the ground, have little or no effect on enemy air operations. Roads, hills, and rivers found in northern regions provide good navigational aids for enemy aircraft. Road-bound maneuver and support units are easily detected and attacked from the air.

Chaparral and Vulcan weapons may be restricted to roads and limited numbers of accessible positions. They may not be able to accompany light infantry units, which will have to depend on Redeye teams, individual weapons, and machineguns for close-in air defense protection. Rather, C/V weapons may have to be located with and defend control and support elements in accessible areas. Mechanized units will be restricted to movement into accessible areas and positions. Chaparral and Vulcan units will be positioned with mechanized units to help protect the most vulnerable maneuver, control, and support elements against air attack.

Mobility varies considerably according to the season. The most suitable time for ground operations is from mid-winter to early spring before the breakup period. Self-propelled Vulcan and Chaparral generally possess good mobility during this time period. During the spring thaw, the ground becomes saturated, roads become flooded, and low-lying areas are turned into a morass of mud. Airmobile resupply may be necessary.

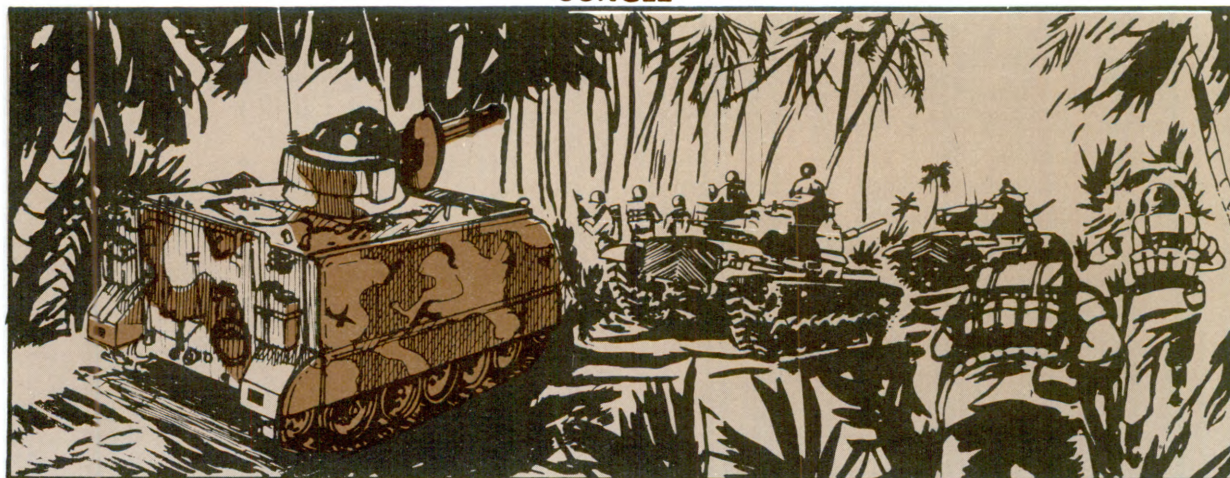
Extreme and prolonged cold has an adverse effect on all weapons and equipment. Equipment warmup time will be increased. Sluggish operations, malfunctions, and broken parts are common. Additional time should be provided to perform preventive maintenance since extreme cold can more than double the time it takes personnel to perform even the simplest maintenance task.

The wearing of bulky, heavy clothing and gloves required in northern regions will also slow reaction of personnel. Particular emphasis must be placed on training personnel to operate in extreme cold and wet climates. Wearing of proper clothing, changing wet clothing, and recognizing symptoms of frostbite should be emphasized and constantly checked by leaders.

Overdressing may cause as many problems as not wearing enough warm clothes.

Exhaustion is common in cold climates, especially when operating at high elevations.

JUNGLE



Warfare in jungle areas may be characterized by:

- Use of lightly equipped forces moving primarily by foot or air.
- Engagements conducted by platoons and companies rather than battalions and brigades.
- Increased use of ambushes, raids and patrols.
- Restricted maneuvering.
- Close combat under conditions of extremely limited visibility.
- Difficulty in providing logistical support.
- Slow tempo of operation.

Since dense jungle offers good concealment for maneuver forces, enemy air attacks may be directed primarily against combat service support units, supply lines, exposed field artillery units, and bases of operation. However, air attack of maneuver units can also be expected when they must cross open areas such as rice paddies or rivers. Critical points along lines of communications that cause units to concentrate (such as bridges, ferries, and

clearings) will also be subject to enemy air attack. Although the number of defended areas will normally decrease in jungle operations, those subject to attack will become increasingly critical and may justify a higher level of defense than similar assets in another type of operation.

Because of the above, *Chaparral and Vulcan are mixed and deployed in mass, along with Redeye, to defend a relatively small number of high-priority assets.* Where vehicular movement is possible through the jungle, Vulcans are used to protect convoys from both ground and air attack while Chaparrals may be prepositioned to protect vehicular traffic passing through critical points. The high humidity and rainfall characteristics of jungle areas will limit the acquisition capability of the Chaparral weapon. Thus, the effective range may be reduced. This may require weapons to be positioned closer together and more weapons than usual be allocated to the defense of a particular asset. Chaparral and Vulcan firing positions that offer 360° observation and fields of fire will be difficult to find. Chaparral and Vulcan units defending stationary assets may have

to clear trees and underbrush to have adequate firing positions.

Due to the dense foliage, roads are few and narrow, making vehicular traffic difficult and, at times, impossible. The many swamps, rivers, and streams common to jungles will also severely restrict mobility. Areas that are accessible will require greater travel times to be reached, and many areas will be totally inaccessible by ground, necessitating the use of helicopters and airplanes for the movement of troops and equipment. Measures that can be taken to minimize the effects of the jungle include:

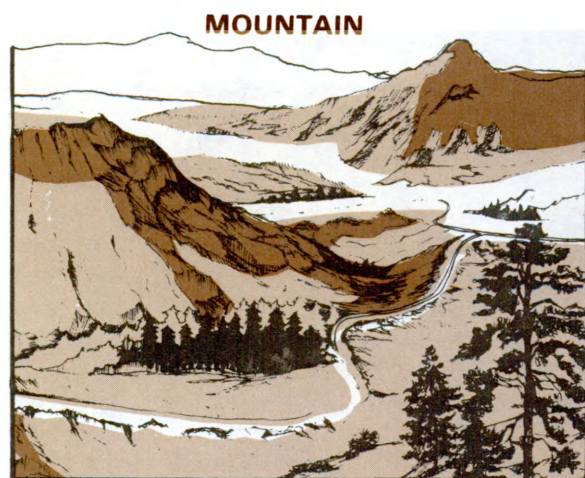
- Training in river and swamp crossings.
- Making a careful and detailed reconnaissance.
- Making maximum use of engineer support to provide access to and for clearing positions.
- Utilizing helicopter support whenever possible.
- Enforcing supply discipline to minimize the need for resupply.

Thick vegetation, high humidity, and rugged, hilly terrain will reduce the range of FM radios. When radio is used, special purpose one-fourth wavelength antennas should be provided. The restricted movement of jungle operations, plus the jungle's effect on radio communications, will increase dependence on use of wire. As suitable routes are limited for laying wire and it takes considerable time, Chaparral/Vulcan units may find it more practicable to tie into switchboards of supported units and assets rather than attempting to establish their own wire communications.

Rust, corrosion, and fungus growth will require an additional maintenance effort. Weapons, vehicles, radios, and clothing will wear out faster; their availability will decrease, and commanders will have to use equipment at less than peak condition. Measures that can help are:

- Keeping electronic equipment turned on. The heat generated will help eliminate moisture, corrosion, and fungus.
- Frequent cleaning of equipment.
- Not exposing sealed ammunition and repair parts until their use is required.
- Protecting individual clothing and equipment; look at items not in constant use.
- Taking along only equipment and repair parts necessary for a particular operation.
- Determining what maintenance problems other units are having with like items and how they solve them.

Personnel must be well trained and acclimated to the jungle environment. Heat exhaustion and jungle diseases carried by insects are common. Proper individual sanitation, wearing of protective clothing, and use of insect repellant will minimize these health risks.



Mountainous warfare is normally characterized by:

- **Small unit operations.**
- **Fields of fires restricted by masking and terrain obstacles.**
- **Restricted mobility, with movements often being restricted to existing road networks.**

Mountainous terrain offers distinct advantages to attacking enemy aircraft. Aircraft can avoid radar and visual detection by flying at low level, through valleys and mountain passes to strike their targets with little or no warning. Heavy ground forces and combat support and combat service support units are road-bound, providing lucrative air targets. Narrow mountain roads are often restricted to one-way traffic with no room for passing. One vehicle disabled by an air attack may stop an entire column, making it a sitting target for field artillery, ground, or follow-up air attack.

Movement in mountainous terrain is hampered by scarcity of roads and crowded conditions on roads that do exist. The terrain favors the use of small, lightly equipped maneuver elements. The nature of the terrain will normally afford these elements good cover and concealment, but they will at times be exposed and vulnerable to air attack. Chaparral and Vulcan units will often be unable to accompany these elements; good firing positions may be inaccessible for Chaparral and Vulcan weapons. The man-portable Redeye may be the only air defense weapon that can accompany and provide close-in air defense protection for maneuver units as they traverse rugged terrain. Chaparral and Vulcan units may be restricted to defending

control and support elements in more accessible portions of the battlefield. Defenses of critical assets will be weighted toward likely or forced low-altitude air approaches using a mix of Chaparral and Vulcan when possible. FAARs will be employed to provide alert warning oriented toward these approaches and covering those areas masked to Hawk radar detection. Chaparral and Vulcan squads will make maximum use of observers to cover approaches masked from the gunner's view by terrain obstacles.



Special equipment is usually required for units operating in high mountainous terrain where cold prevails. Supplies and maintenance personnel need to be brought as far forward as possible. Vehicle carburetors must be adjusted for high-altitude operations.

Chaparral and Vulcan units will rely primarily on radios for communications, but hill masses and forests will degrade distance and quality of FM radio transmission. Use of long-wire antennas and radio relays will help overcome these difficulties.



APPENDIX G

OPERATIONS in ACTIVE NUCLEAR, BIOLOGICAL or CHEMICAL (NBC) ENVIRONMENT

For nearly 25 years the US Army has had nuclear weapons deployed as an integral part of the weapons inventory, and such weapons are also deployed to support Allied nations. The Soviet Union and other countries have also fielded a nuclear capability for battlefield use. The use or threatened use of nuclear weapons will have a profound effect on the modern battlefield.

During WW I, the first large scale chemical attacks were made, achieving results that led to a major use of chemical weapons on the battlefield. During that war, ***chemical weapons proved to be four times as effective*** in producing nonfatal battlefield casualties as high-explosive (HE) weapons. Since 1918, however, toxic chemical weapons have not been used on a WW I scale. The use of chemical weapons since WW I has essentially been restrained by the threat of retaliation in kind. Many nations, however, now possess the capability to employ these weapons.

This appendix describes characteristics of nuclear, chemical and biological weapons; their effects on equipment and personnel; and protective measures to be taken during operations in active NBC conditions.

CONTENTS

	PAGE
Section I. Nuclear	
Nuclear Battle	G-1
Weapons Effects	G-2
Protective Measures	G-4
Section II. Chemical and Biological	
Conditions of Use	G-7
Agent Characteristics	G-7
Detection	G-7
Protective Measures	G-7

Section I. NUCLEAR

NUCLEAR BATTLE

No treaty or international agreement prohibits the use of nuclear weapons in warfare. ***If a Threat force has nuclear weapons, Chaparral and Vulcan units must be prepared to operate in a nuclear environment at the outbreak of hostilities.*** The Threat might employ nuclear weapons from the start, or he might attack in a conventional manner and use them later.

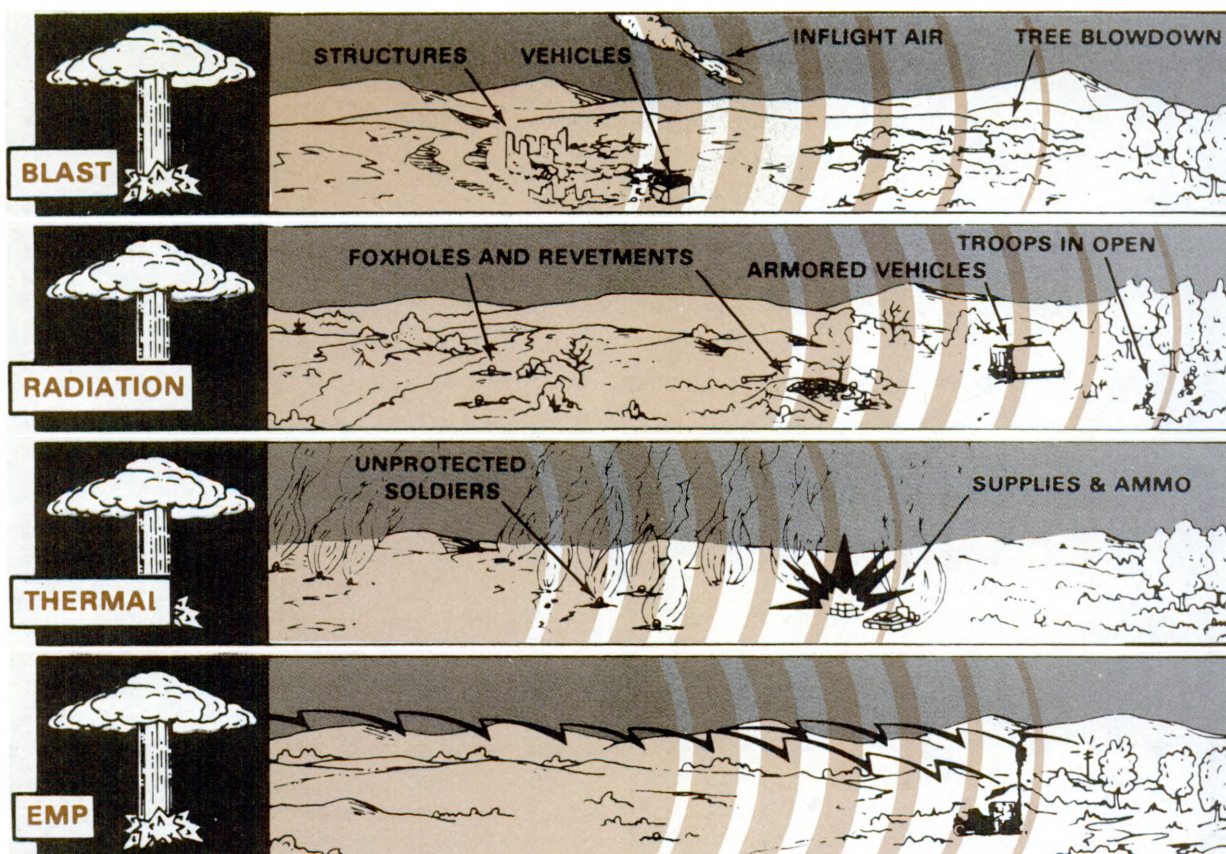
G-1

Chaparral and Vulcan units will fight on the nuclear battlefield essentially the same as on the conventional battlefield. Tactics used on the conventional battlefield—concealment, overwatch, and suppression—are also used on the nuclear battlefield. However, combat service support and communications will be disrupted more than on the conventional battlefield, and batteries and platoons in support of task forces and company teams may be isolated for extended periods. Battalion task forces and larger forces will

concentrate only when absolutely necessary, to avoid creating a lucrative nuclear target.

Threat forces that possess nuclear weapons plan for their employment in both offensive and defensive operations as the basis of all fire planning. Nuclear attacks are combined and coordinated with conventional fires and air attacks, and exploited rapidly by ground forces. Nuclear weapons may also be employed with chemical and/or biological agents.

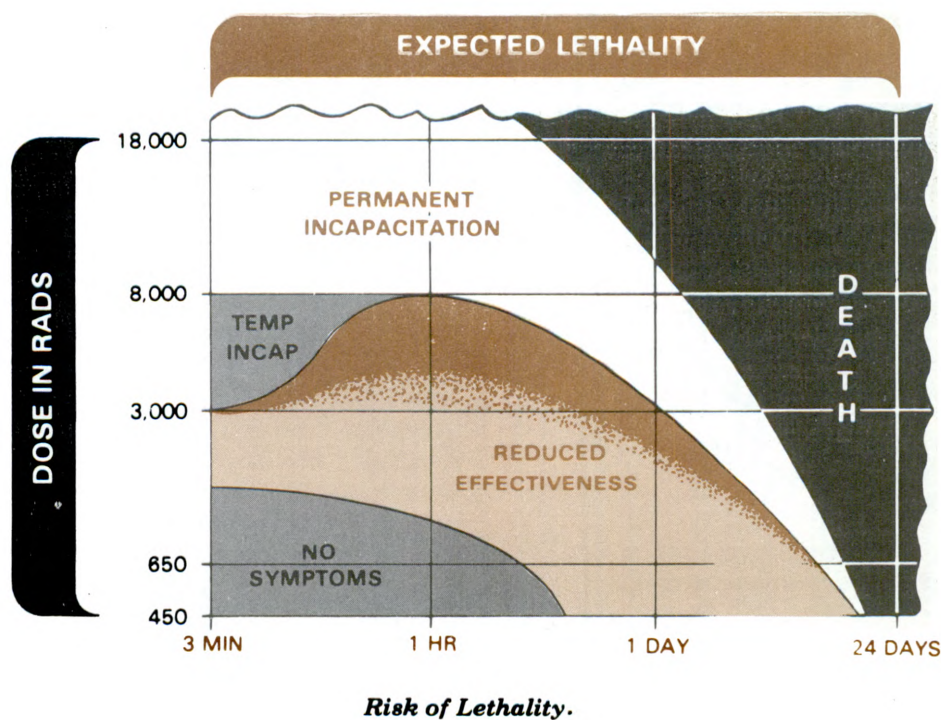
WEAPONS EFFECTS



Nuclear detonation effects present new phenomena and increased destructiveness on the battlefield when compared to conventional firepower. **Blast effect** is vastly increased, and, in the smaller yields, **radiation** has the most significant effect on troops whether they are in the open, in armored vehicles, or in foxholes. **Thermal radiation** is an added danger to unprotected soldiers. The **electromagnetic pulse (EMP)** which comes from a nuclear burst can damage radios, radars, and other electronic equipment, seriously interfering with command and control communications and target acquisition systems.

Fallout can also produce casualties, delay movements, and deny terrain if the task force is unprepared to detect radiation and take protective measures from its effects.

For the yields of weapons most likely to be used on the tactical battlefield (1 to 10 kilotons), radiation is the main killer. The immediate incapacitation radiation level is 8,000-18,000 rads (unit of measure for radiation). An active soldier suddenly exposed to as little as 3,000 rads could become incapacitated within 3-5 minutes. He may recover to some degree in about 45 minutes, but due to vomiting, diarrhea, and other radiation sickness symptoms, he would be only partially effective until he dies within a week. A soldier exposed to 650 rads initially shows no symptoms, but loses some of his effectiveness in about 2 hours and can be expected to die in a few weeks under battlefield conditions. Exposure in the 100 rad region usually has little effect.



In addition to the immediate effects of nuclear weapons, ***the commander must also be concerned with residual radiation*** resulting from fallout, rainout, and induced radiation. When a nuclear weapon detonates too near the surface of the earth—dust, debris, and heavy particles which are sucked up into the air fall to the ground and create areas of lethal radiation. Similar results could occur when the cloud from a nuclear burst, even at a fallout safe height (about 50 meters for a 1 KT), passes through rain which then carries radioactive particles to the earth. Radiological monitoring is essential to detect areas contaminated by rainout, induced radiation, or fallout.

PROTECTIVE MEASURES

FOR SURVIVAL

EVERY SOLDIER MUST KNOW

- The characteristics and effects of nuclear explosions.
- How to recognize and protect himself against nuclear attacks.
- The procedures for masking.
- The conditions for masking without alarm.
- The procedures for unmasking.
- How to remove radiological particles from himself and his equipment.
- How to perform first aid for casualties caused by nuclear attacks.

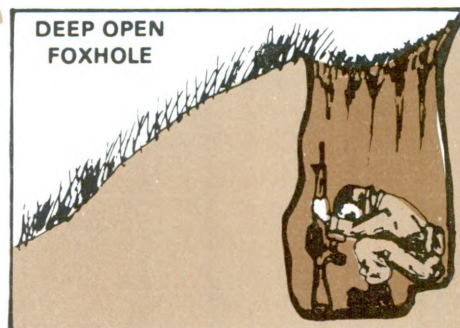
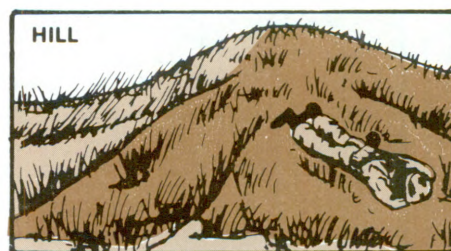
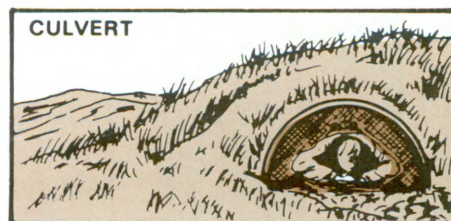
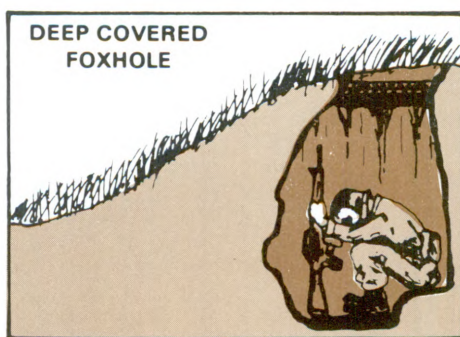
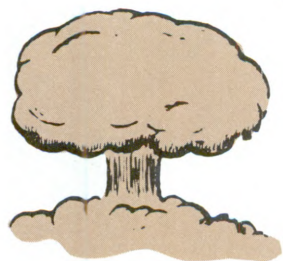
The nuclear weapon, although a tremendously destructive device, is ***not*** a weapon against which there is no defense. ***The more each soldier knows about nuclear weapons capabilities, the more effective he will be on the nuclear battlefield and the greater will be his chances for survival.*** Training must stress the interrelated importance of discipline, camouflage, cover, concealment, dispersion, and immediate reaction for battlefield survival.

Hazard from fallout may last for days and cover many square miles. Since nuclear radiation cannot be detected by the physical senses, ***radiac instruments are provided to the unit for the purpose of measuring radiation.*** When operating on the nuclear battlefield, radiological monitoring is included in all reconnaissance activities according to procedures established by higher levels of command. After residual radiation has been detected by radiological monitoring, the C/V unit continues its mission, and may relocate along with the unit supported or defended to minimize radiation exposure.

If it is necessary to remain ***in the fallout area***, when possible vehicles button up completely with the crews remaining inside. Other personnel occupy shelters with overhead cover. ***Personnel who must continue the air defense mission should wear protective masks and clothing.*** The period of time a unit may remain in a contaminated area depends on intensity of radiation and protection available. Time spent away from cover must be minimized.

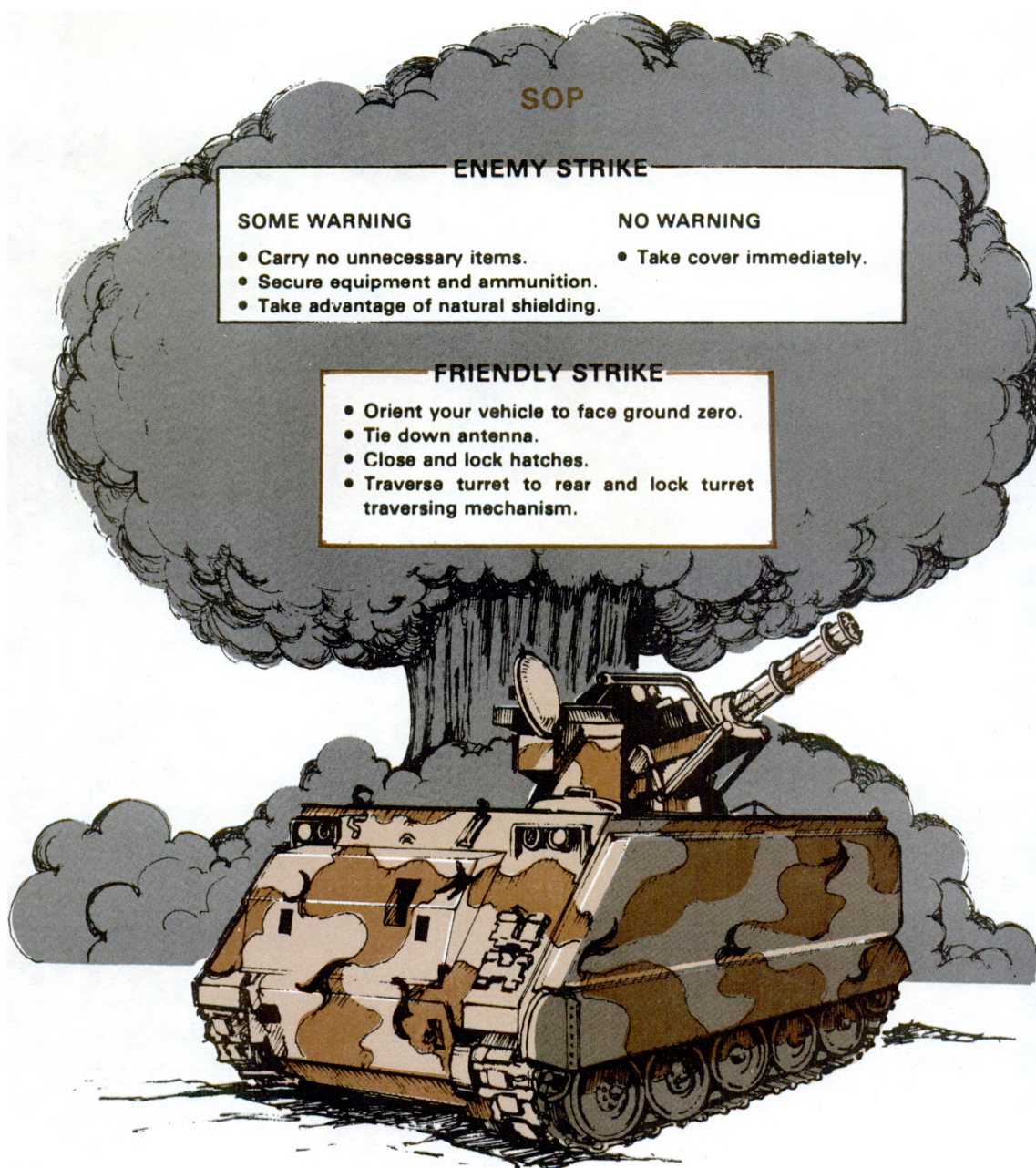
Once fallout has stopped, radioactive dust on top of shelters and vehicles must be brushed away. This will serve as emergency decontamination; however, complete decontamination must be accomplished as soon as possible.

The measures illustrated below provide protection against the initial effects of nuclear weapons to include blast, heat, and nuclear radiation. Deep, covered foxholes or deeply buried culverts offer the best protection against fallout.



Operations on a nuclear battlefield require that individual protective measures be performed without detailed direction.

Unit SOPs must include actions taken during both friendly and enemy employment of nuclear weapons.



Section II. CHEMICAL OR BIOLOGICAL

CONDITIONS OF USE

It is the policy of the United States to not use toxic (lethal) chemical weapons first. However, they may be used if an enemy employs them against the United States. The United States will not use biological weapons under any circumstances. Threat forces have both chemical and biological weapons and are prepared to use them, so *Chaparral/Vulcan units may have to fight in active chemical and biological conditions.*

AGENT CHARACTERISTICS

Lethal chemical agents are similar to poisonous compounds used in everyday life to kill flies, mosquitos, and other insects but are far more powerful, and are released to cover relatively large areas. They may be placed on a target as a gas, as finely divided liquid or solid particles (aerosols), or as liquid droplets. A mixture of agents can be used to cause confusion and increase casualties. They can be disseminated by field artillery, mortars, rockets, missiles, aircraft spray, bombs, and landmines. They may be odorless and colorless.

Biological agents are disease-producing microorganisms (germs). The intentional use of microorganisms creates a disease hazard where none exists naturally. These biological agents may be dispersed as aerosols by generators, explosives, bomblets, missiles, and aircraft. Harmful microorganisms may also be spread by the release of living insects, such as flies, mosquitos, fleas, and ticks.

Chemical and biological agents may enter the body through the eyes, nose, mouth, or skin. They can produce incapacitation or death. Liquid agents may be dispersed on equipment, terrain, and foliage. The agent may remain for hours or days, presenting a serious hazard to unprotected personnel.

Chemical and biological agents have little direct effect on equipment.

Liquid chemical agent contamination on equipment can cause casualties or restrict its use until appropriate decontamination is accomplished. Emergency decontamination of vehicles and equipment is accomplished by crew members (see TM 3-200, CBR Decontamination).

Liquid chemical agents may restrict use of terrain and buildings.

Decontamination of terrain is beyond the capabilities of the C/V units. Contaminated areas may either be bypassed or crossed when individual protective equipment is worn. Soldiers and equipment must be decontaminated after a mission in a contaminated area.

DETECTION

Chemical agents can be detected by using a chemical agent detector kit, an automatic chemical agent alarm, detection paper, or crayon (see FM 21-40). Soldiers cannot rely on odors to detect chemical agents because some are odorless.

Biological agents are usually difficult to detect during early states of use. Soldiers should be alert to any indication that biological agents are being used. Usually, occurrence of diseases must be promptly reported.

PROTECTIVE MEASURES

Chaparral/Vulcan units must train to apply protective measures against toxic chemical and biological attack.

Standing operating procedures (SOP) must provide for a warning system, use of individual and unit protective equipment, and for procedures for prompt decontamination of individuals, equipment, and supplies, and prompt treatment of casualties.

REMEMBER

■ **A SOLDIER'S PRIMARY PROTECTION AGAINST TOXIC CHEMICAL AND BIOLOGICAL ATTACK IS HIS PROTECTIVE MASK.**

■ **TO BE PROTECTED AGAINST LIQUID CHEMICAL AGENTS, SOLDIERS MUST WEAR CHEMICAL PROTECTIVE CLOTHING AS WELL AS MASKS.**



Complete individual protection is provided by wearing the mask with hood, protective overgarments, protective socks with chemical resistant boots, and protective gloves. Chemical protective clothing and equipment also provide protection from biological attack.

Unless the unit is well trained and conditioned in NBC protective operations, the loss of operational effectiveness associated with wearing protective clothing due to heat stress, respiratory strain, psychological stress, reduced mobility, visual acuity, and manual dexterity will have an adverse effect on mission accomplishment. Soldiers wearing chemical protective equipment have a limited tolerance time for hard work and must be allowed to attend to body functions.

Once chemical agents have been employed or while the threat of

chemical attack exists, the battalion commander determines the level of protection required. This decision, called mission-oriented protective posture (MOPP), is based on the chemical threat, mission, work rate, and temperature. Whenever possible, the commander specifies the degree of protection before the mission. He may subsequently direct that the protection be modified, according to his continuing estimate of the situation. Subordinate unit commanders down to squad leader level may also need to modify the MOPP based upon existing conditions and the particular work rate of their personnel.

REFERENCE

Detailed information on operations in an NBC environment is contained in FM 21-40.



APPENDIX H

OPERATIONS SECURITY (OPSEC)

Operations security includes those security measures that are necessary and appropriate to allow us to maintain surprise by denying the enemy information concerning planned, ongoing, and completed operations. When used successfully, OPSEC denies the enemy tactical advantage gained from learning the *how, when, where, and why* of our operations.

OPSEC is implemented throughout all phases of a combat operation by application of operations security measures designed to neutralize enemy intelligence collection efforts to determine location, capabilities, and intentions of friendly forces. *These OPSEC measures include:*

SIGNAL SECURITY — The use of communications security techniques (communication codes, secure voice equipment, radio-telephone operator procedures) and electronic security techniques (use of radio silence, proper positioning of radars and antennas) to prevent disclosure of operational information.

INFORMATION SECURITY - The protection of written, verbal, and graphic information to prevent disclosure of operational information.

DECEPTION - Actions taken to mislead the enemy on current or intended operations for a specified time period. The objective of deception is to keep the enemy misinformed. Deception includes all actions taken to surprise or mislead the enemy thereby causing him either to react in a way favorable to friendly forces, or not react at all.

PHYSICAL SECURITY - The use of security forces, barriers, and anti-intrusion devices to protect operational information or activities from enemy access to facilities, areas, equipment, materiel, or personnel.

CONTENTS

	PAGE
The Enemy Intelligence Collection Threat	H-1
Relationship of OPSEC to ADA Survivability	H-2
Integration Into the Force OPSEC Plan	H-3
Radioelectronic Combat Threat	H-3
Suppressive Attacks	H-4
Operations Security Measures	H-5
Standing Operating Procedures	H-9

How these OPSEC measures can be implemented is discussed later in this appendix.

THE ENEMY INTELLIGENCE COLLECTION THREAT

Threat force commanders will use all intelligence collecting means at their disposal to learn our capabilities and intentions. These means include the following categories:

H-1

Human Intelligence (HUMINT) -

Human intelligence is the process of using people to obtain information. These people generally rely on their senses, particularly sight and hearing, to obtain that information. HUMINT can be collected through use of air or ground reconnaissance, interrogation, and/or intelligence agents. Information reported includes what has been seen, heard, or collected. Examples include information seen on posted maps and vehicles (markings), overhearing conversation concerning tactical or strategic information, and gathering written material that has been improperly safeguarded.

Signal Intelligence (SIGINT) -

Signal intelligence consists of communications, electronic, and telemetry intelligence and is the product resulting from the collection, evaluation, analysis, integration, and interpretation of all information derived through these sources. SIGINT may be used to locate units through intercepting and monitoring signals produced by a signal-emitting device. Monitoring emissions can be as simple as tapping a field telephone line or as complex as using a sophisticated electronic device to determine the type, purpose, location, and capability of a previously undetected radar system. Sensors, used for SIGINT purposes, can intercept signals from radios and radars. Data collected by ground-based or airborne sensors are sufficiently accurate to allow the emitter to be targeted for artillery fire or air attack.

Electronic Warfare (EW) - Electronic warfare includes:

- Electronic countermeasures (ECM) used to overcome or degrade the effectiveness of electronic equipment.

- Electronic counter-countermeasures (ECCM) used to overcome the ECM effort against the electronic equipment.

The enemy may use his EW assets to intercept, locate, and target our acquisition and target tracking radars. This will allow him to use ECM against them or attempt to destroy them through air or ground action. The enemy can also monitor and/or disrupt our communications nets to obtain information of intelligence value, or locate our tactical units, and degrade our command and control measures.

Photographic Intelligence (PHOTINT) -

Photographic intelligence uses infrared and other sophisticated photographic equipment aboard aircraft, or other airborne platforms, to gain information. PHOTINT is the most widely used detection method as it provides a permanent record of exact details of an area and permits long-term comparisons to discover changes in details. PHOTINT is considered the most accurate means of pinpointing target locations.

RELATIONSHIP OF OPSEC TO ADA SURVIVABILITY

Destruction of our forward area ADA weapons systems is of prime importance to the Threat forces as their elimination will increase freedom of action for Threat air forces and result in the subsequent decline in our commanders' ability to maneuver. The intelligence collecting techniques used by the Threat to determine the capabilities, locations, and intentions of our forces are the same techniques that the Threat will use to locate and plan the suppression of our ADA weapon systems. The OPSEC measures used to counter the Threat intelligence collecting techniques are the same techniques that must be used to insure ADA survivability. It is therefore obvious that OPSEC and survivability are synonymous to ADA commanders and weapon crewmen, and that

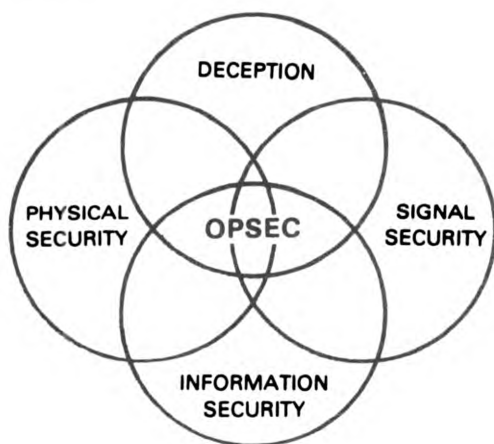
a viable **OPSEC program not only enhances ADA survivability but also contributes to ADA mission accomplishment** and to the success of the force our ADA is supporting.

INTEGRATION INTO THE FORCE OPSEC PLAN

The discussion of OPSEC in this appendix is oriented towards survivability of forward area ADA weapons. However, OPSEC is a continuing process and relates to the force as a whole—not just the supporting ADA. **Conducting an OPSEC analysis is the first step of the process. Three things have to be done:**

1. Estimate the hostile intelligence threat.
2. Determine the sensitive aspects of the operation.
3. Determine OPSEC vulnerabilities.

Based on this analysis, the force OPSEC plan is formulated and disseminated throughout the command for execution. **The plan** will outline OPSEC measures to permit the force to maintain surprise. **These will incorporate measures in all four main categories of security measures. All are interrelated;** each must be considered simultaneously for each operation.



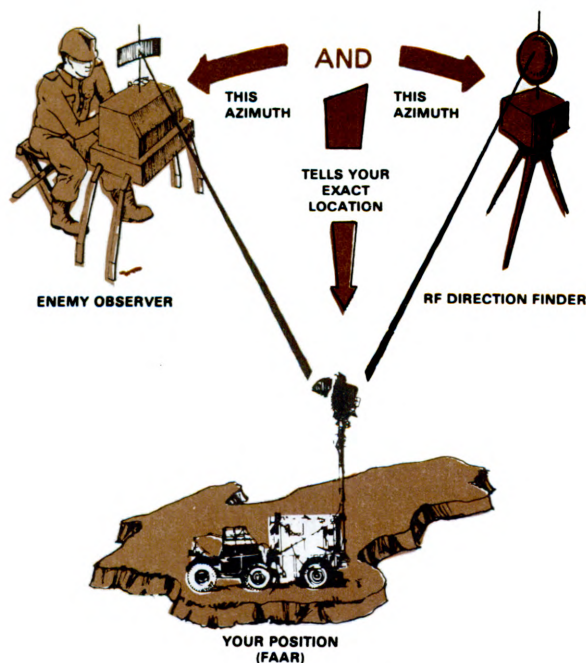
RADIOELECTRONIC COMBAT THREAT

Radioelectronic combat is a term used by Threat forces to indicate the integration of signal intelligence, intensive jamming, deception, and suppressive fires to deprive their adversary of command and control in combat. It is expected that Threat forces are aware of the dependence that our forces place on communications. **The Threat will use radioelectronic combat to systematically analyze our communications and noncommunication emitters**, which serve as keystones on which command and control of our forces are dependent. **The Threat may then be expected to attempt to destroy or disrupt our command, control, and weapon system communications wherever possible using suppressive fires or electronic jamming.** This is the essence of radioelectronic combat.

Because air defense weapon communications systems and radars provide good targets for Threat direction finding equipment, **air defense units and weapons are high-priority targets for radioelectronic combat.**

The Threat employs direction-finding devices to locate our electronic emitters and uses this information in conjunction with other information **to provide targets for enemy suppressive fires and jammers.** As direction finding of radio transmitters is not precise, the Threat's suppressive artillery fires will usually not be fired at locations provided only by direction finding. However, there are exceptions. Due to the high concentration and wide dispersal of multiple-rocket launcher fires, these weapons may be used against soft targets located by direction finding with a good chance of destroying the targets. Suppressive fires are also effective against most radars, as radars can be located much more accurately than radio transmitters by direction finding. In too many instances the Threat direction-finding effort may be successful because of information provided by poor signal security (SIGSEC) or poor

ECCM techniques of operators. For instance, the operator who takes longer than necessary in making transmissions or who repeats transmissions, gives the Threat more time to pinpoint his location. Also, if an operator uses excessive power in combating ECM, the Threat can more easily locate the friendly transmitter. Thus, the communications operator becomes the target of the enemy EW effort.



Radio Direction Finding (RDF).

SUPPRESSIVE ATTACKS

Once the ADA site is located, the enemy will attempt to destroy the unit or neutralize its effectiveness. To take appropriate countermeasures, unit commanders must have an appreciation for the suppressive measures the enemy will employ. ***Suppressive attacks*** employed by the enemy ***will include one or a combination of the following:***

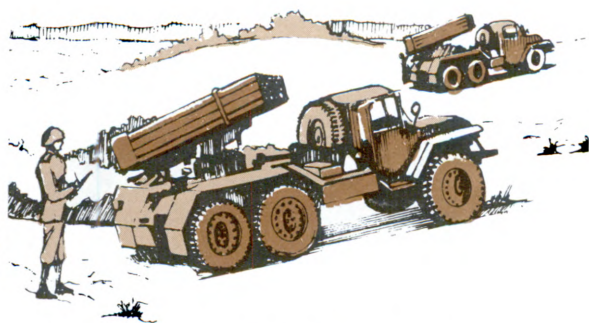
Tactical Air-to-Surface Missiles (TASM) - Tactical air-to-surface missiles are those air-to-surface missiles that are launched from fighter-type aircraft. All employ guidance systems that provide a high degree of accuracy, although the method of guidance varies with each system. Some typical examples of TASMs include antiradiation missiles (ARM), electro-optical guided missiles, laser-guided missiles, beam-rider guided missiles, and radar-guided missiles. Anti-radiation missiles home on radio-frequency (RF) emissions from acquisition tracking radars. ARMs vary from small supersonic rockets to large subsonic cruise systems. Future ARMs can be expected to achieve accuracy against low-power pulse (Vulcan/FAAR) radars.

Airborne Sensors - These sensors are employed aboard standoff and attack aircraft to detect radar and radio emissions. Standoff aircraft may be stationed beyond the FEBA to intercept radar and radio signals from deep in friendly territory.

High-Performance Aircraft and Helicopter Gun Ships - These aircraft will attack using conventional air-delivered ordnance such as cluster bomb units (CBU), bombs, napalm rockets, cannon, and machineguns. The use of optical-, TV-, and laser-guided weapons must be assumed.

Surface Weapons - Field artillery cannons, multiple rockets, long-range surface-to-surface missiles, small arms, and antitank weapons can engage ADA units in forward areas. Enemy tank and mechanized forces may be used to

neutralize or destroy ADA units by penetrating into areas where they are located. The 122-mm rocket provides the enemy with a devastating area-fire weapon for use in air defense suppression. Smoke rounds delivered by either friendly or enemy weapons will interfere with the operation of visually-directed air defense weapons (Chaparral, Vulcan, and Redeye).



122-mm Rocket Launchers.

Electronic Countermeasures - The use of ECM against radios will isolate an ADA system by intruding into the radio net, by deception techniques, or by interrupting radio communications between the command and control element and the firing position. Electronic countermeasures employed against radars degrade detection ranges, increasing operator reaction time, and allowing aircraft to penetrate the defense. Degradation of communications, radar systems, and missile guidance systems will increase the Threat pilot's chances to survive. Related to the ECM threat is the Threat's use of infrared flares or countermeasure devices to misdirect the heat-seeking Chaparral and Redeye missiles after they have been fired.

OPERATIONS SECURITY MEASURES

The obvious answer to survival on the battlefield is to become invisible and undetectable, or in other words, *hide*. The problem, however, lies in how you can hide an air defense system as large as a Vulcan or Chaparral. Also, since the emission of electromagnetic radiations is necessary to the operation of the FAAR systems, how can you operate and remain undetectable if your radars must radiate? The answer is, of course, that you cannot do these things totally. You must compromise; *positive measures can be taken to counter the suppression efforts of the enemy. Thus, operation security measures increase the probability of survival greatly and still allow for effective operation.* Operation security measures include all passive, active, tactical, and technical measures available to the C/V commander to defeat or reduce the effectiveness of enemy air defense suppression efforts. The objectives of the air defense operations security effort are to:

PREVENT THE ENEMY FROM LOCATING YOU.

PREVENT THE ENEMY FROM DELIVERING ORDNANCE ON YOU.

MINIMIZE DAMAGE IF HE DOES.

DECEPTION

Deception, particularly when combined with frequent movements, is an effective way to deny the enemy knowledge of your current position. Deception makes use of the fact that the enemy usually cannot inspect your position closely. The enemy can also be fooled if something can be made to look like a real item of equipment. *One effective way to deceive the enemy is to use dummy positions and decoys.*

Dummy positions are positions equipped with decoys (facsimiles) of real equipment items which are employed as the real system would be. They can be left unattended or may be used with personnel present, performing simulated operations. Consideration should be given to deliberately exposing one or two decoy items (e.g., an uncovered shiny object which can be seen through the camouflage) to attract the attention of the enemy. Such positions work well only if the real position is well camouflaged. By switching both actual and decoy units from position to position, the enemy's detection and targeting problems can be significantly increased. When you move, you may also want to consider leaving decoys at your old position. Then if your position has been detected or reconnoitered prior to your move, the enemy will return and attack your old position. This can cause him to waste time and ordnance and make him believe that he has destroyed you. ***Dummy positions can be used as traps to draw an attack and expose the enemy's aircraft to destruction by air defense weapons positioned in the vicinity.***

CAMOUFLAGE

Probably the most important means of avoiding visual detection is through camouflage and concealment of vehicles, equipment, and personnel. The idea is to take advantage of the terrain and vegetation to conceal yourself from direct observation by the enemy and to use camouflage to blend into the natural background. The old saying that "A camouflaged ADA unit looks like a camouflaged ADA unit," is not valid. ADA weapons can be hidden using ordinary camouflage materials and natural foliage.

The key to successful camouflage is blending with the terrain and reducing contrasts. Natural material such as tree branches, grass, and brush provide the best camouflage. However, natural material will wilt and die and must be replaced with fresh materials periodically. These should be obtained at least several hundred meters

away from the site when possible. To reduce glare, vehicles are pattern-painted with drab paint. Windshields on wheeled vehicles should be removed or covered and tied down. The Chaparral glass canopy should be covered until just before an engagement sequence; enemy pilots and ground soldiers can see windshield glare for miles. Camouflage nets can be used to hide vehicles in stationary positions. Geometric patterns must be avoided. Vehicles should be parked to take advantage of natural concealment and shadows. Remember that shadows move as the sun or moon move. A vehicle in the shadows at 0800 may not be at 1100.

Camouflage discipline must be enforced as carelessness can compromise the most cleverly and carefully camouflaged position. Strict measures should be taken to prevent the accumulation of battlefield litter on or near your position. Ration cans, boxes, papers, discarded equipment, and other trash are easily spotted from the air and are a dead giveaway to the unit's location.



Camouflaged Vulcan Position.

Vehicle signatures include dust, exhaust smoke, and tracks on the ground. Dust is reduced by route selection and speed control. Exhaust smoke can be reduced by proper maintenance and driving. To aerial observers, track patterns indicate size, location, and tactical disposition of a unit. They can be reduced by enforcing a strict

movement plan. In snow or sand, track patterns should be covered.

LIGHT AND NOISE DISCIPLINE

Light and noise discipline must be rigidly enforced. Lights can be seen from long distances at night and noise carries a long way on a still night. Both can give away the location of your position. Only those lights that are absolutely necessary should be used and care must be exercised that they are covered or shielded. Restrict cigarette smoking to shielded areas. Horseplay, loud talking and laughter, and the striking of metal against metal must be prohibited to keep down noise. Engine noise can be reduced by digging in and/or revetting generators.

MOVEMENT

One of the most effective means of denying the enemy current position knowledge is through frequent movement. Movement to enhance survivability need not involve great distances. Alternate positions can be selected within a short distance from the primary position and can be occupied when necessary. Movements should be made at night or during inclement weather whenever possible, both to conceal the movement and to capitalize on decreased enemy air activity. The movement should be planned so that it is rapid and orderly and so that the air defense effectiveness is not unduly degraded during the move. Consider moving by echelons or in several serials spaced from 15 to 20 minutes apart. This will reduce confusion in the new area. If only three or four vehicles move into the new area at a time, they can move in rapidly and quietly. When the move is made during the night, considerable confusion will result if the whole battery is waiting to move in. Remember, noise and light discipline must be enforced. **A general rule to follow is—consider movement if any of the following occurs:**

- Recent air reconnaissance of your area.
- After an engagement.

- The position has been fired on.
- The position has been occupied for a period of time (normally 4 to 6 hours for Chaparral, Vulcan, or Redeye).

COMMUNICATIONS SECURITY

Communications security (COMSEC) denies or delays unauthorized persons from gaining information of value from monitoring communications. **OPSEC measures enhancing COMSEC include:**

- Use of authentication systems to protect the communications system against fraudulent messages and fraudulent receipts for bona fide messages. (Use only approved authentication tables to prevent enemy cryptanalysis.)
- Assignment of new frequencies and call signs through frequent changes in the force CEOI to help deny Threat monitoring agencies information concerning disposition and identification of tactical units.
- Strict adherence to radio-telephone procedures. (requires continuous operator training and net discipline.)
- Using radio only when required to support tactical operations.
- Use of wire communications or messengers whenever possible.
- Locating antennas with a hill mass or other obstacle between the site and the enemy.

Our radio operators can anticipate that Threat forces will attempt to disrupt our radio communications through an intensive jamming effort. An effective ECCM program requires that operators learn to:

Recognize jamming. If interference is heard, do not immediately assume jamming as symptoms of jamming are often similar to other types of radio interference. Try to determine what is causing the interference. Disconnect the

receiver antenna to see if a signal is being generated internally by the receiver. If the interference decreases with the antenna removed, the interference is probably external and may be jamming.

Continue to operate. Radio operations should continue in a normal manner once jamming has been identified so that the jammer cannot determine the effectiveness of his jamming. The rule to follow is to continue operations during jamming unless ordered to shut down.

Report jamming. As soon as jamming is recognized, a report should be submitted to the next higher headquarters using an alternate means of communications. A jamming report format is included in the CEOI or tactical TSOP.

ECCM TECHNIQUES

Techniques that operators can use to counter jamming include:

Use of low-power transmissions. Transmitting on low power reduces the opportunities for the enemy to hear the transmission. If the signal can't be heard, the transmitter can't be located by radio direction finding. Obviously, if the friendly station can't hear the signal either, the radio is of little use. The trick is to use only enough effective radiated power to be heard within the net but not enough to be heard by the enemy. Tactical VHF radios have only two power settings: *low* and *high*. Most operators use only the high setting because they incorrectly think low power is useless.

EXAMPLE

A Chaparral platoon will be deployed so that its weapon squads will normally be separated by approximately 2 kilometers and rarely be more than 3 or

4 kilometers from their platoon headquarters. The radio transmits an effective signal which may be received by radio direction finders at a distance well in excess of 10 kilometers, perhaps 30 kilometers, even when the transmitter is set on low power. On the high-power setting, a radio direction finder may be able to intercept the signal at distances from 30 to 80 kilometers while airborne radio direction finders can intercept the high-power signal at a distance of 80 kilometers. Because of the short distance required for radio transmissions, low power should always be used.

One simple operator procedure that can be used to reduce electronic radiated power (ERP) of the AN/VRC 12 and AN/PRC 77 family of radios is to bend the whip antenna toward the ground and keep it in the tied-down position. This technique will reduce the ERP at certain frequencies, particularly between 60 and 76 MHz. Bending the antenna will also deform the radiated pattern in the horizontal plane which is another counter-RDF technique. TM 11-5820-667-12 provides additional information. Always use an antenna tip assembly to prevent eye damage from tied-down antennas.

Use of mobile antenna. A reduced height VHF ground-plane antenna can be mounted into a pole holder welded to the front bumper of a truck or APC and secured with guy wires. This procedure provides a mobile antenna which can be rapidly relocated and does not tie a command post to an antenna array. This technique is superior to remoting antennas since it allows for greater mobility. The mobile antenna has excellent applications in desert operations.

APPENDIX I

TACTICAL OPERATIONS CENTER

The Chaparral/Vulcan (C/V) battalion commander exercises control of his units through his tactical operations center (TOC). The TOC is established at the battalion command post which is located where the commander can best control his units and coordinate with other command posts. It displaces as necessary to keep pace with movement of the battle and for self-protection. The S3 supervises operation of the TOC.

CONTENTS	
	PAGE
Functions	I-1
Organization and Equipment	I-1
Target Alerting and Early Warning Procedures.....	I-5

FUNCTIONS

The C/V tactical operations center—

- Plans, supervises, and directs air defense operations.
- Receives and disseminates air defense fire control orders and information.
- Collects, processes, evaluates, and disseminates intelligence on both the ground and air battles.
- Receives and disseminates NBC information.
- Determines and maintains the current operational status of subordinate units.

- Performs or assists in routine functions such as the preparation of operations orders, journals, situation maps, records, and reports.

ORGANIZATION AND EQUIPMENT

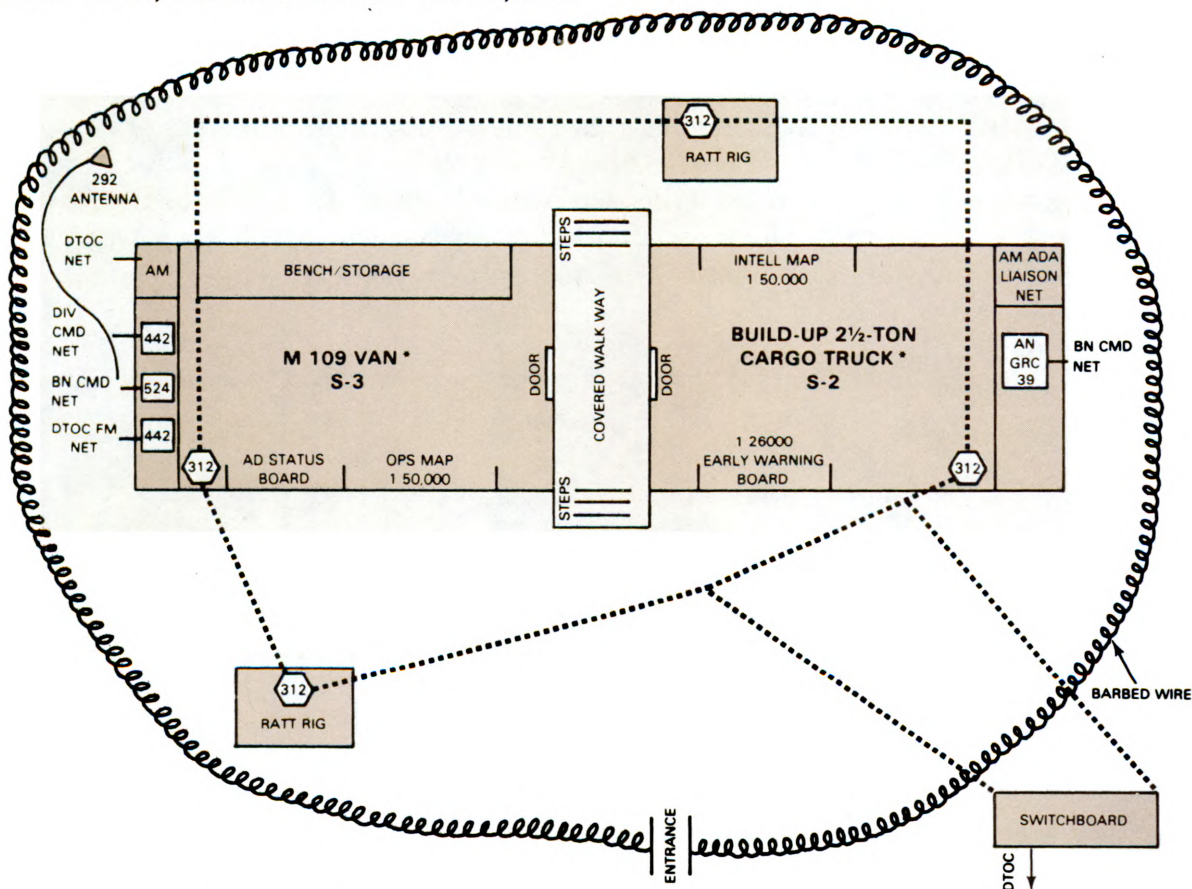
PERSONNEL

The TOC is staffed by personnel from the operations and intelligence section and communications section. It normally has two 12-hour shifts with the night shift being minimally manned.

ORGANIZATION

There is no standard layout for the TOC; it will vary from unit to unit depending on the unit's needs, the commander's desires, and

material available. A typical layout for a C/V battalion TOC is shown.



*Mobility of the command post must be commensurate with that of the supported force. Tracked command post vehicles will be required in battalions supporting armored and mechanized infantry divisions.

C/V Battalion Tactical Operations Center.

EQUIPMENT

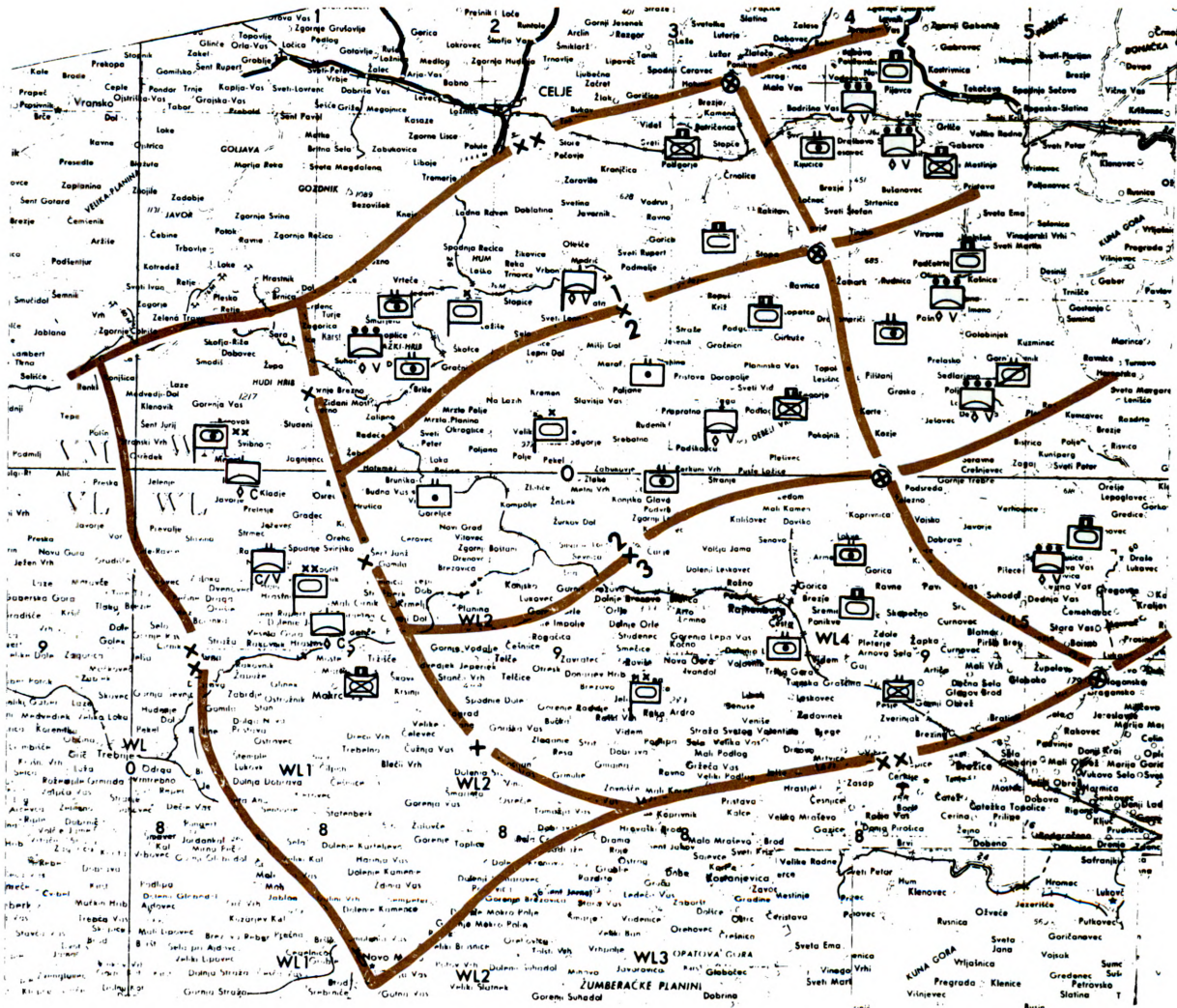
The TOE will provide the appropriate vehicles, communications equipment, and other standard items of equipment necessary to perform TOC functions.

Information required to facilitate operations and enhance decision-making

must be displayed in the TOC on "situation boards" and maps. Exact requirements vary from organization to organization and depend upon the location, SOP, and mission of supported forces. However, the following "situation boards" are normally needed:

Operations board - The operations board usually consists of enough topographical maps to adequately cover the friendly and enemy situation. It will depict the current friendly and enemy situation, the location of organic and supporting ADA units, and other information the commander desires. Platoon

locations will be pinpointed when possible; however, it may be possible to show only approximate platoon location of Vulcan units supporting company teams during offensive operations. The operations board may be supplemented by an intelligence board maintained by the S2.



Early warning plotting board - The early warning plotting board covers the same area as the operations board plus an additional area to permit display of early warning information. The board is marked with the normal military grid reference system. An early warning matrix is superimposed so

aircraft tracks can be plotted and the positions immediately passed down using a common grid reference system. Each air defense weapon is issued the same matrix so no conversion is necessary when passing aircraft locations.

CN	DN	EN	FN	GN	HN	JN	KN	LN	MN	NN	PN	ON	RN	SN	TN
CM	DM	EM	FM	GM	HM	JM	KM	LM	MM	NM	PM	OM	RM	SM	TM
CL	DL	EL	FL	GL	HL	JL	KL	LL	MM	NL	PL	QL	RL	SL	TL
CK	DK	EK	FK	GK	HK	JK	KK	LK	MK	NK	PK	QK	RK	SK	TK
CJ	DJ	EJ	FJ	GJ	HJ	JJ	KJ	LJ	MJ	NJ	PJ	QJ	RJ	SJ	TJ
CH	DH	EH	FH	GH	HH	JH	KH	LH	MH	NH	PH	QH	RH	SH	TH
CG	DG	EG	FG	GG	HG	JG	KG	LG	MG	NG	PG	QG	RG	SG	TG
CF	DF	EF	FF	GF	HF	JF	KF	LF	MF	NF	PF	QF	RF	SF	TF
CE	DE	EE	FE	GE	HE	JE	KE	LE	ME	NE	PE	QE	RE	SE	TE
CD	DD	ED	FD	GD	HD	JD	KD	LD	MD	ND	PD	QD	RD	SD	TD
CC	DC	EC	FC	GC	HC	JC	KC	LC	MC	NC	PC	QC	RC	SC	TC

Status board - The status board shows the current operational status of all firing systems

and FAARs. Their physical locations are recorded as required by SOP.

AIR DEFENSE STATUS BOARD

DEFCON: TIME:		A.D. WARNING: TIME:		WEAPONS CONTROL STATUS: TIME:				
CP CALL SIGN				ALERT STATUS DESIGNATOR:				
				TIME:				
UNIT	LOCATION	CALL SIGN	NET	STATES OF ALERT BS STBY SEC O/A				REMARKS

TARGET ALERTING AND EARLY WARNING PROCEDURES

EARLY WARNING

The C/V battalion has no dedicated long-range early warning radars. It usually relies on the direct support Hawk battalion for its early warning. The air defense coordination section (ADCS) of the C/V battalion collocates with the Hawk CP and sends early warning information directly to the C/V battalion TOC and the DAME over a dedicated AM ADA liaison net. The information is passed along to weapons through battery and platoon FM command nets.

The positions of hostile/unknown aircraft detected outside the battalion are plotted on the TOC early warning plotting

board and, when the track approaches the battalion area of responsibility, are disseminated to weapon systems for engagement using a common grid system (matrix).

TARGET ALERTING

The C/V TOC is also responsible for the positioning of FAAR sections. To facilitate this, the FAAR platoon headquarters will collocate with the C/V battalion TOC and establish an FM link with its FAAR sections. The FAAR sections will provide target alerting information directly to C/V platoons and Redeye teams by FM radio-frequency data link (RFDL).



APPENDIX J

COMMUNICATIONS

The ability of a Chaparral/Vulcan commander to react to rapidly changing conditions on the modern battlefield is dependent on **efficient** and **reliable** communications throughout his command and with senior and supported units. Radio and wire communications means are provided the C/V units to facilitate command and control. Because the Chaparral/Vulcan weapon squads are widely dispersed and subject to frequent and rapid moves, radio is the primary means of communications during employment and operations. To enhance communications security, wire and messengers are used instead of radios during operation planning. Radio nets are supplemented and paralleled by wire nets when time, the tactical situation, and security permit their use.

The control, use of, and reliance on radio communications for command, control, and early warning render Chaparral/Vulcan operations especially vulnerable to exploitation of friendly transmissions by hostile collection and electronic countermeasures activities. Communications planners must give special and continuous attention to provisions for communications security and for effective ECCM to cope with the potential threat or the actual use of hostile jamming or deception. Communications security is discussed in appendix H.

CONTENTS

	PAGE
Responsibility	J-1
Battalion	J-2
Headquarters and Headquarters Battery	J-5
Chaparral/Vulcan Battery	J-6
Supplemental Early Warning	J-12

RESPONSIBILITY

The commander is responsible for providing effective communications and for insuring continued unit operations through SOP should communications fail.

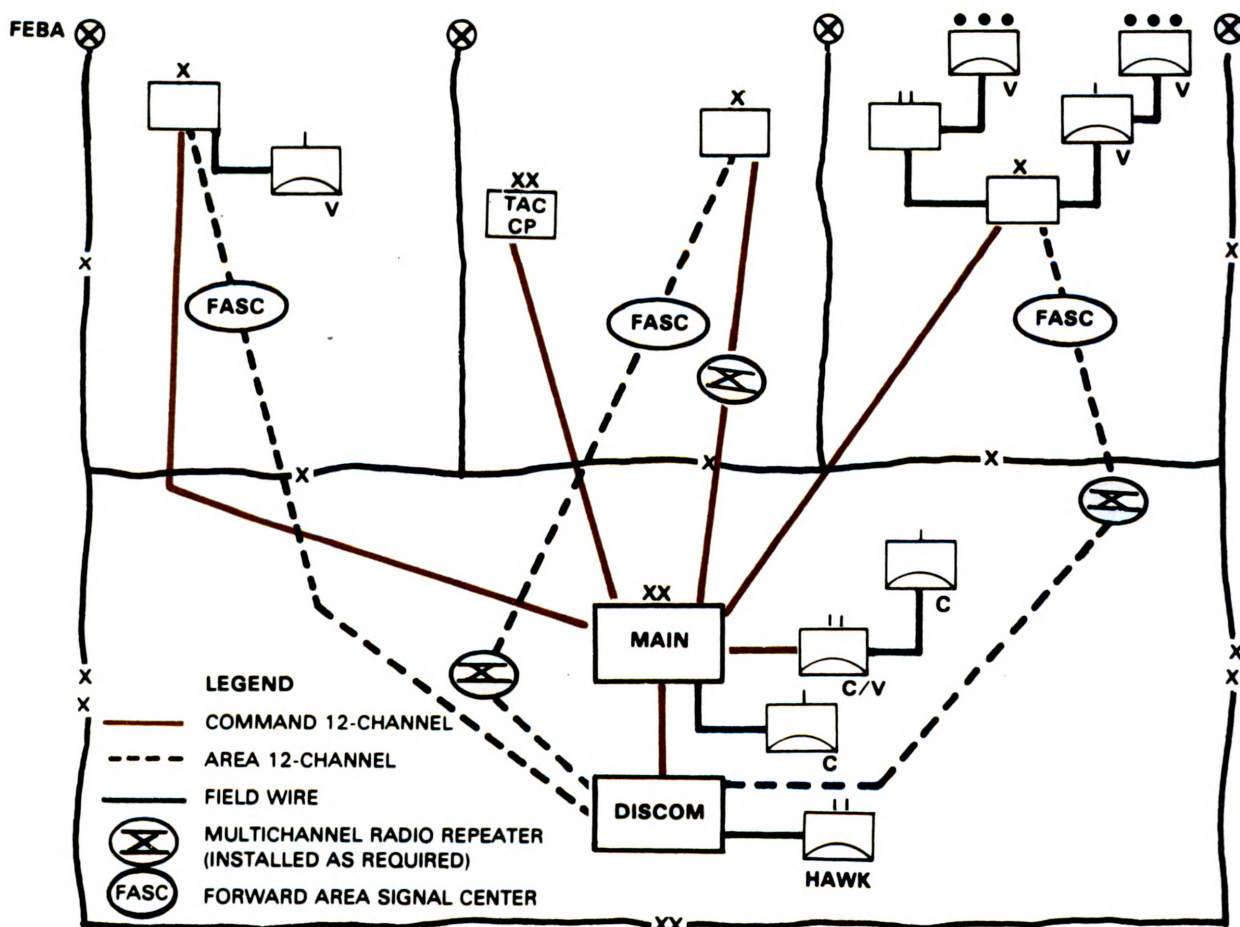
The unit communications-electronics staff officer is responsible for:

- Advising the commander on matters pertaining to the employment of communications equipment.
- Informing the commander of additional communication requirements.
- The proper installation, operation, and maintenance of unit communications equipment.
- Informing the commander promptly of all security violations, both communications and physical.

BATTALION

Inter- and intra-battalion communications are conducted through the establishment of radio and wire nets. Although the communications nets shown are normal and can be supported by communications-electronic equipment authorized each divisional C/V battalion by TOE, exact composition of communication nets are dictated by the desires of the division and C/V battalion commanders and the equipment authorized and/or available to each battalion. Communications requirements are similar for Vulcan battalions and nondivisional C/V battalions.

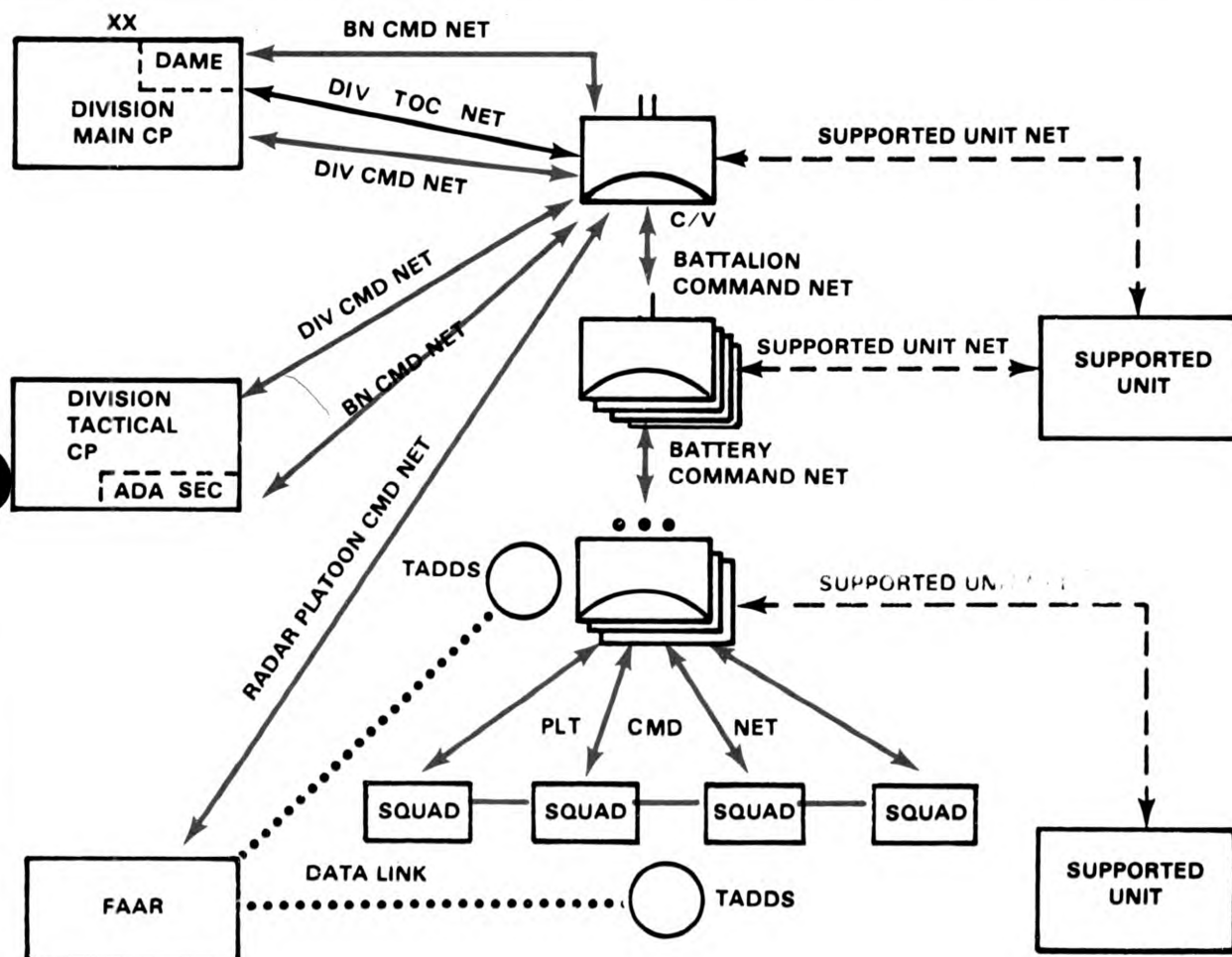
The division signal battalion installs and operates the multichannel portion of the division communications system throughout the division area of operations. As shown in the sketch, this provides the C/V battalion with 12-channel communications between the TOC and the division main command post. This, in turn, allows for multichannel communications between the TOC, AME, ADA team at the division tactical CP, and any other element of the C/V battalion that has established wire communications with any major element of the division that is a part of the division multichannel communications network.



Chaparral/Vulcan Tie-In to Division Multichannel Communication System.

The majority of FM radios within the divisional C/V battalion belongs to the AN/VRC-12 family of VHF radios. These include the AN/VRC-46 (transmitter/receiver), AN/VRC-47 (transmitter/two receivers), and AN/VRC-48 (transmitter/three receivers). As shown in the overview, these radios are used in unit command nets,

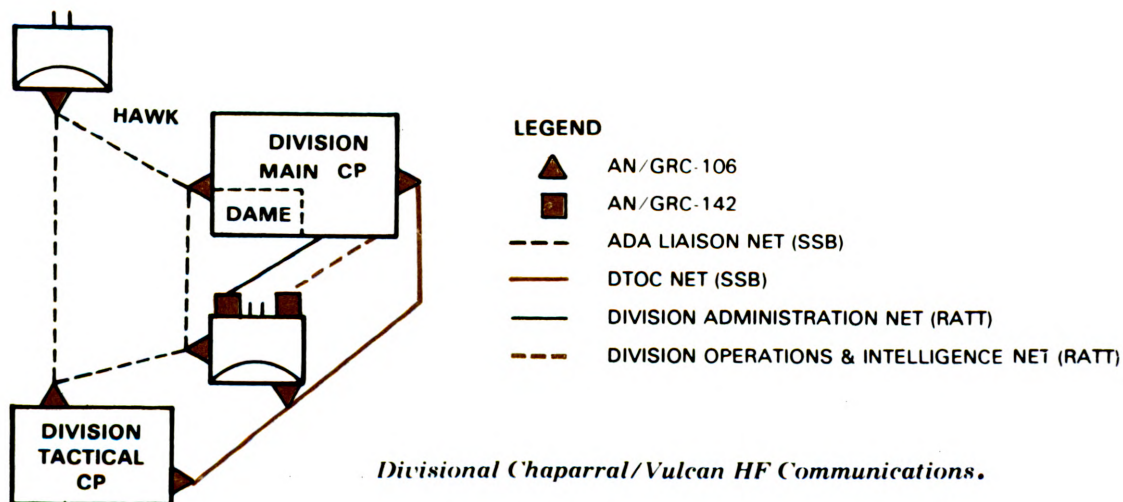
provide the data link between FAARs and TADDS, and provide VHF communications between the battalion and other division elements. *Each command level from battalion to squad has the capability of monitoring and entering VHF radio nets of the units they are supporting.*



Division C/V Battalion FM Communications (Overview).

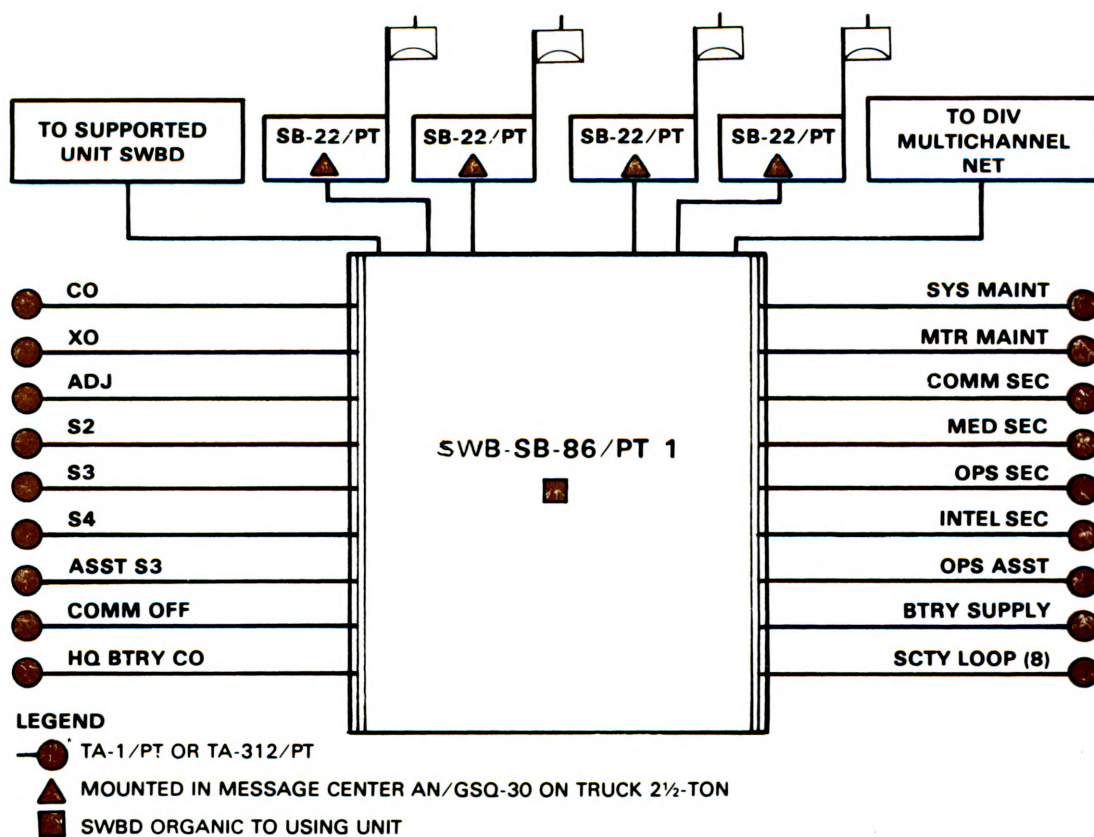
The only HF communications within the divisional C/V battalion are the AM/SSB radios issued to the headquarters and headquarters battery. These provide the battalion access to the division tactical operations center (DTOC) SSB net and the division operations and intelligence (RATT) and the

administration (RATT) nets. The ADA liaison net shown is a C/V battalion net connecting the battalion AD coordination officer at the DS Hawk battalion and the battalion's airspace management personnel (at the division main and tactical CPs) with the battalion TOC.

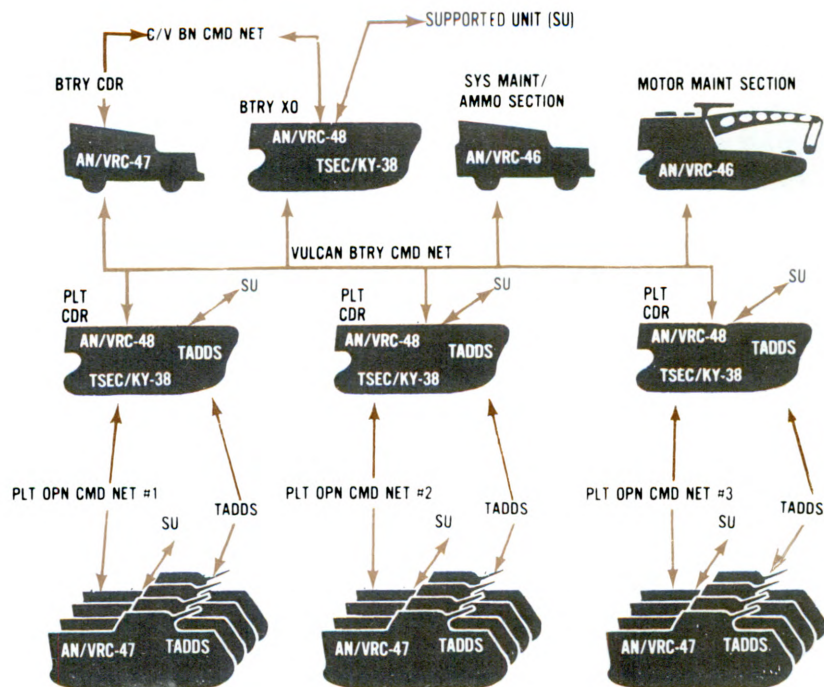


The battalion communications section normally installs wire throughout the battalion headquarters and to other battalion agencies and

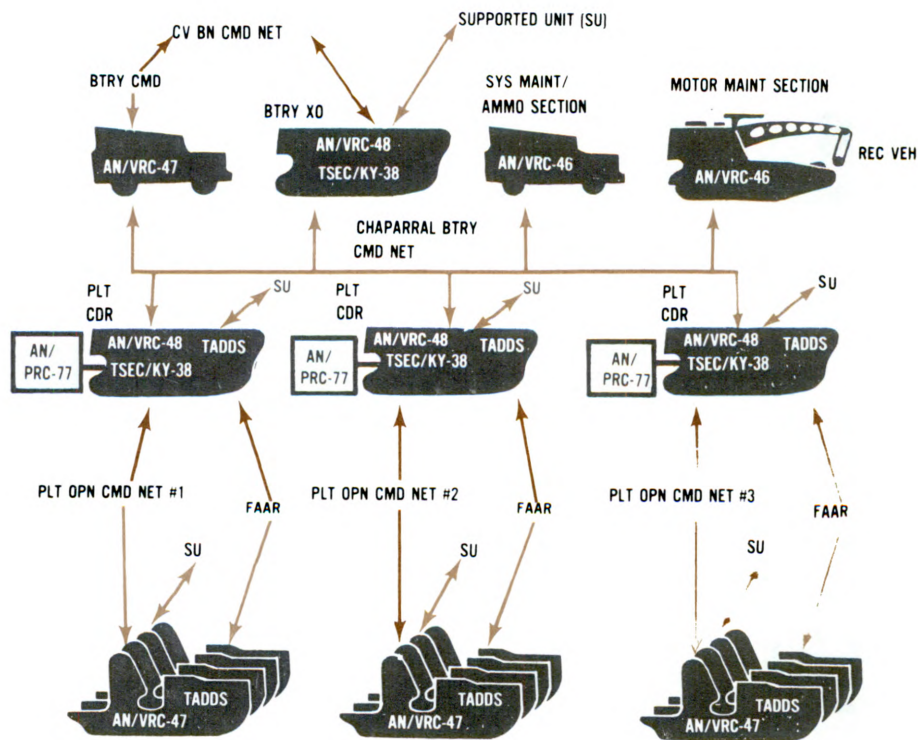
units as is practical. Access to the division multichannel communications system is provided by the division signal battalion.



Type Wire System, Divisional Chaparral/Vulcan Battalion.



Divisional Vulcan Battery - Type FM Nets.



Divisional Chaparral Battery - Type FM Nets.

WIRE NETS

Often the tactical situation makes use of wire communications impractical, and C/V units must rely on radio and messengers for both the internal and external communications. However, wire communications are established to the extent practical whenever possible. Each C/V battery has the necessary equipment to install the following wire nets:

Squad

Weapon squads normally lay wire to squad command and observation posts. In addition, wire lines may be established between each squad and—

- The platoon command post.
- Adjacent squads.
- The supported unit.

Platoon

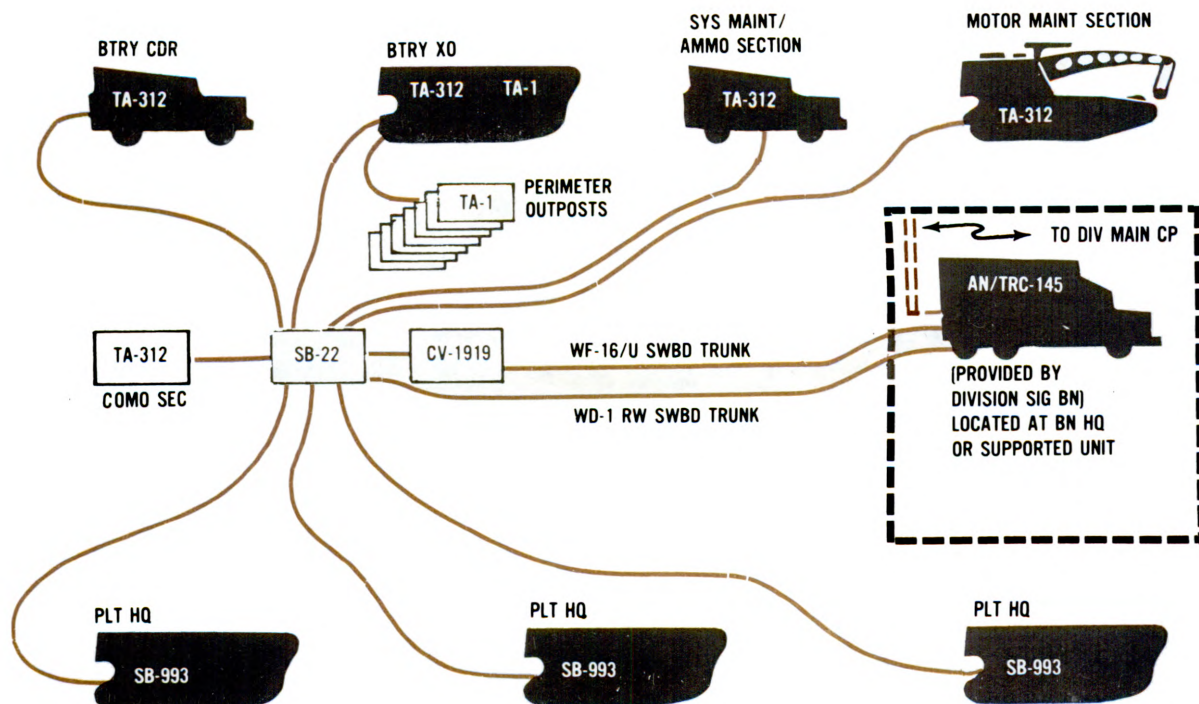
Wire nets may be established between each platoon and—

- The battery command post.
- The supported unit.

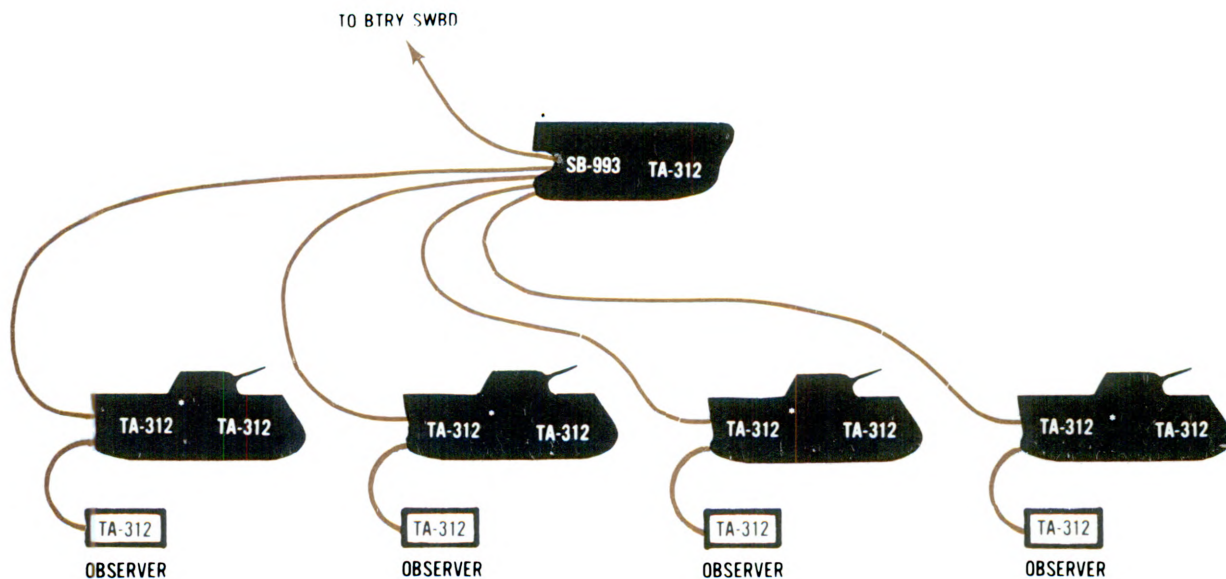
Battery

Each C/V battery will normally establish intra-battery CP wire communications. In addition, wire communications may be established between the battery and—

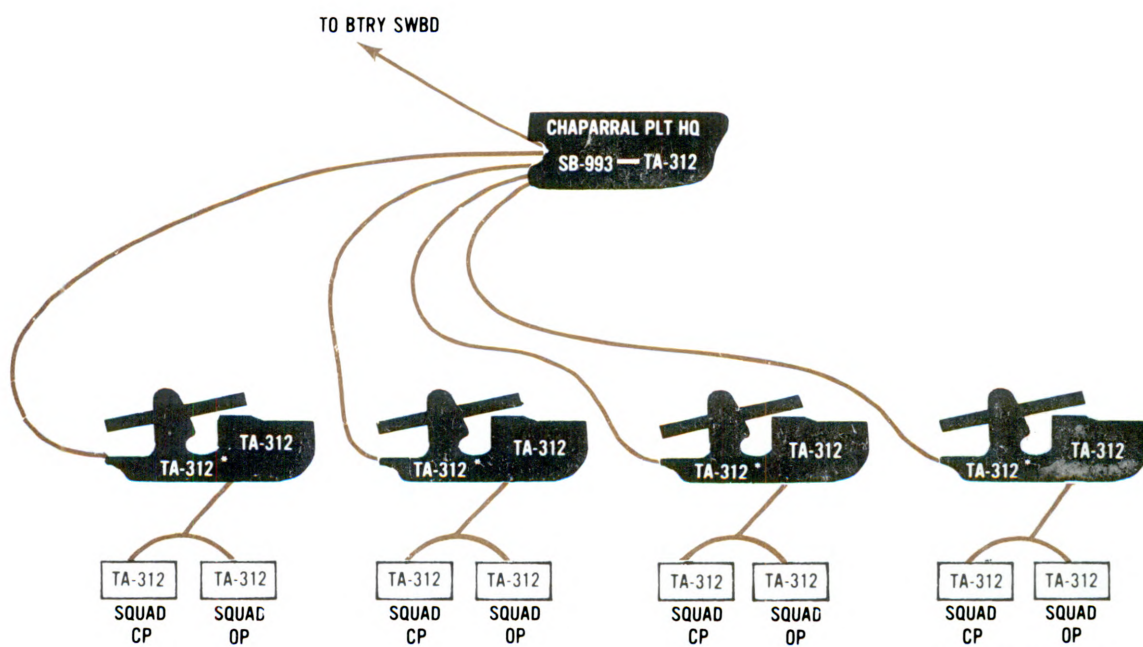
- One or more of the platoons.
- The battalion TOC.
- Supported or adjacent units.



Divisional C/V Battalion - Type Chaparral/Vulcan Battery Wire Net.



*PROVIDED BY PLT HQ

Type Vulcan Platoon Wire Net.

*PROVIDED BY PLT HQ

Type Chaparral Platoon Wire Net.

MULTICHANNEL CIRCUITS

Divisional C/V batteries do not normally receive multichannel communications support from the division signal battalion. However, a C/V battery or subunit can be connected to a division multichannel communications system when wire communications are established between the unit and a unit receiving division multichannel communications support.

SUPPLEMENTAL EARLY WARNING

To be effective, *aircraft early warning information* obtained by the air defense

coordination section (ADCS) at the DS Hawk battalion *must be passed promptly to Chaparral and Vulcan weapon squads and to Redeye sections and teams*. Many divisions establish AM and FM early warning nets with the objective of providing this early warning information to users with little time lost in retransmission. Information is passed by the ADCS on AM radio to the C/V battalion TOC, which rebroadcasts the information over an FM net. Intervening levels of command monitor the division FM early warning net and retransmit information to subordinate organizations over command radio nets or telephone "hot loops."



APPENDIX K

REFERENCES

PUBLICATION INDEXES

Department of the Army pamphlets of the 310-series should be consulted frequently for the latest changes or revisions of references given in this appendix and for new publications relating to material covered in this manual.

ARMY REGULATIONS (AR)

- 310-25 Dictionary of United States Army Terms.
310-50 Authorized Abbreviations and Brevity Codes.

FIELD MANUALS (FM)

- 1-60 Airspace Management and Army Air Traffic in a Combat Zone.
5-36 Route Reconnaissance and Classification.
6-20 Fire Support for Combined Arms Operations.
7-7 The Mechanized Infantry Platoon/Squad.
7-8 The Light Infantry Platoon/Squad.
7-10 The Rifle Company.
7-20 The Infantry Battalions.
11-50 Communications in the Division.
17-36 Armored Cavalry Platoon, Troop, and Divisional Armored Cavalry Squadron.
17-95 The Armored Cavalry Regiment.
21-30 Military Symbols.
21-40 NBC Defense.
21-60 Visual Signals.
24-18 Field Radio Techniques.
24-20 Field Wire and Field Cable Techniques.
30-40 Handbook on Soviet Ground Forces.
32-6 SIGSEC Techniques.
44-1 US Army Air Defense Artillery Employment.
(C) 44-1A United States Army Air Defense Artillery Employment (U).

44-6	Procedures and Drills for Forward Area Alerting Radar (FAAR) and Target Alert Data Display Set (TADDS).
44-23	Air Defense Artillery Employment, Redeye.
44-30	Visual Aircraft Recognition.
44-90	Air Defense Artillery Employment, Hawk.
71-1	The Tank and Mechanized Infantry Company Team.
71-2	The Tank and Mechanized Infantry Battalion Task Force.
71-100	Brigade and Division Operations (Mechanized and Armor).
71-101	Brigade and Division Operations (Infantry/Airborne/Airmobile).
90-2	Tactical Deception.
90-3	Desert Operations.
90-4	Air Assault Operations.
90-5	Jungle Operations.
90-6	Mountain Operations.
90-9	Night Operations.
90-10	Military Operations in Built-Up Areas.
90-11	Northern Operations.
90-12	Airborne Operations.
90-13	River Crossing Operations.
100-5	Operations.
100-28	Doctrine and Procedures for Airspace Control in the Combat Zone.
100-42	US Army/US Air Force Airspace Management in an Area of Operations.

TRAINING CIRCULARS (TC)

17-11-1	Tips for Good Communications.
17-12-4	Aircraft Engagement Techniques for Armored and Cavalry Units.
23-44	Small Arms Defense Against Air Attack.
32-10	EW: How to Train a Combat Battalion to Fight in an Electronic Warfare Environment.
44-30	Ground Observer Aircraft Recognition (GOAR) Kit.
44-71	Commander's Guide to Redeye.
44-71-1	Redeye, How to Use It.
101-5	Control and Coordination of Division Operations.

FM 44-3

30 SEPTEMBER 1977

By Order of the Secretary of the Army:

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